

Torbjørn Tronsmoen

Lay and professional practical driver training in Norway:

A comparison of subject matter content and traffic safety outcomes

Thesis for the degree of Philosophiae Doctor

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Norwegian University of Science and Technology
Faculty of Social Science and Technology Management
Department of Psychology



NTNU – Trondheim
Norwegian University of
Science and Technology

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Preface

What are the most important differences between formal and informal practical driver training, and what are the consequences of these differences? Are they so similar that it would be possible to replace formal driver training with solely informal training? Are there important issues that lay instructors don't deal with that must be taken into consideration when designing the formal driver training and driver training as a whole? Further, how do we measure associations between practical driver training and skill and safety related competencies such as self-assessment of driving ability, safety attitudes and risk behaviour? And to what extent are these safety competencies associated with crash involvement? May they be valid substitutes for crash involvement as outcome variables for the effect of driver training? The present thesis addresses these questions.

The questions are multitude, and there seem to be no final answers. Possible answers generate more questions rather than giving decisive knowledge. Research education involves a process of continuous development throughout the research project. This implies new discoveries, also in relation to the research project itself. If I had known at the outset what I now have learnt, much could certainly have been carried out otherwise, and developed in other directions. The present study comprises three scientific papers and an introduction to place the three papers in a common framework.

First of all; thanks to my supervisor Torbjørn Rundmo, for the many discussions that helped me move forward while working on this thesis. Thanks are also due to Alf Glad, Rune Elvik and Peter Christensen for important contributions at different stages in my work with the papers. I would also like to thank many good colleagues in the Norwegian Public Roads Administration for their valuable input in the form of discussions and practical help, and above all for patience and support in a work process much more time consuming than I had ever imagined.

Thanks to Anne, my beautiful wife, and my children Tord and Mali for their support and interest.

Thanks to the Norwegian Public Roads Administration for funding the study.

Hamar, March 2011

Torbjørn Tronsmoen

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Hva i all vide verden har karakterer fra skolen med kjøring å gjøre?
 Selvom jeg nesten strøk i matte så kan jeg beregne bred sladd.

(Kvinne, 19 år)

“What in the world do my school grades have to do with driving? Even though I almost failed in maths, I can still precisely calculate the width of an intentional rear-wheel skid”

(Woman, 19 years)

List of papers included in the thesis

Paper I: Tronsmoen T. (2008): Associations between self-assessment of driving ability, driver training and crash involvement among young drivers. *Transportation Research Part F 11*, 334–346.

Paper II: Tronsmoen T. (2010): Associations between driver training, determinants of risky driving behaviour and crash involvement. *Safety Science 48*, 35–45.

Paper III: Tronsmoen T. (2011): Differences between formal and informal practical driver training as experienced by the learners themselves. *Transportation Research Part F 14*, 176–188.

Summary

This thesis examines differences between formal and informal practical pre-licence driver training with regard to content, amount, and other didactical properties and associations with variables such as safety attitudes, self-assessment of driving ability, driver behaviour, and crash involvement. The aim of the thesis is to examine the association between psychological constructs and skills which are assumed to be influenced by driver training, and then to examine the relationships to crash involvement.

The thesis is based on a cross-sectional study of a representative sample of young Norwegian drivers aged 18–20 years holding a licence to drive passenger cars (n = 1419). The thesis is based on three scientific papers.

The theoretical basis for the thesis is theories of traffic behaviour and theories explaining accident involvement. The first study examines the psychometric quality of a new measurement instrument for self-assessment of driving ability. The results showed that young drivers' self-assessment of their own driving ability is a multi-dimensional construct. There were differences among young drivers with regard to how they perceived their driving ability and safety skills when driving. One important contribution from the study is a “body dimension” of driving competence, as perceived by the young drivers. This body dimension is in line with several theories, although empirical support has been lacking in previous studies of self-assessment.

The second study examines and compares three different psychological constructs: safety attitudes, self-assessment, and self-reported driver behaviour, all with regard to associations with driver training as well as with crash involvement. The results showed that there were weak, but statistical significant associations between the actual constructs and practical driver training. The results with regard to associations with crash involvement were more convincing. The strongest variable to explain variance in accident involvement was exposure, followed by the dimensions safety orientation and the body dimension from the self-assessment instrument. Also, violation behaviour was statistically significant.

In the third study, the differences between formal and informal driver training were examined with regard to content and amount of training. The results showed substantial

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differences with regard to content and emphasis on elements in the training. Professional driver training emphasised nearly all the educational elements more heavily through the instruction compared to training given by lay instructors. The study also examined the relationship between didactical properties in the practical driver training and the dimensions of safety attitudes, self-assessment and driver behaviour. The results showed weak associations. However, the relationship between didactical properties and specific task skills, one of the dimensions within self-assessment, was fairly strong, accounting for more than 30% of the variance in specific task skills.

Possible implications of the results of the three studies are discussed with regard to the balance between formal and informal driver training, and also with regard to other educational consequences.

1. Introduction

1.1 Background and aims

1.1.1 Young drivers and accidents

In Norway, as well as globally, young drivers are greatly over-represented in crash and fatality statistics. The risk of drivers aged 18–19 years being involved in an accident involving injury is more than six times higher compared to the risk of drivers aged 45–54 years, which is the safest group of car drivers (Bjørnskau, 2003a). The implication of this is a higher risk also to young drivers' passengers and other road users. Traffic crashes are the single greatest causes of death of adolescents aged between 15 and 24 years in OECD countries (OECD, 2006). Furthermore, most road accidents involving young drivers result from human error. In Norway, 75% of fatal accidents in 2006 were caused by lacks in driver competence (Haldorsen, 2007).

The accident patterns for young drivers differ from those for drivers in general. Young drivers are over-represented in accident statistics. Single-vehicle accidents and loss-of-control accidents account for the highest over-representations (Engström, Gregersen, Hernetkoski, Keskinen & Nyberg, 2003). According to Laapotti and Keskinen (1998) the outcome of loss-of-control accidents more often is single-vehicle accidents for young males while the typical outcome of loss-of-control for young females is collisions. In Norway almost half of young drivers' accidents are off-the-road-accidents. Vehicles running off the road indicate that high speed is the problem. Young drivers may have problems adapting their driving speed to the road and driving conditions as well as to their own driving skills. Not only are there problems such as those described above, but young drivers are also especially at risk during night hours (see for example Williams, 1985). Gregersen and Nyberg (2002) observed that young drivers in Sweden were over-represented in crash involvement at night-time, particularly at the weekend. This is also the situation in Norway (Norwegian Public Roads Administration in Hedmark County, 2003).

Yet another known fact is the strong decrease in accident risk month by month after licensing (Gregersen, Berg, Dahlstedt, Engström, Nolén, Nyberg, Nygaard & Rimmö, 2000a; Gregersen, Berg, Engström, Nolén, Nyberg & Rimmö, 2000b; Mayhew, Simpson & Pak, 2003; OECD, 2006; Sagberg, 1998; 2000). The strong decrease in crashes during a limited time span demonstrated by empirical findings may indicate the risk reduction to be a result of driving experience, and experience to be a main factor in

the development of driving competence. The OECD (2006) concluded that lack of driving experience is one of the basic factors contributing to young drivers' crash involvement. Consequently, it is an obvious measure to provide young drivers with as much driving experience as possible before licensing.

Clarke, Ward and Truman (2002) distinguished between causal factors that are primarily related to driver attitude, and those that are apparently concerned with skill deficits. They found that in the case of for all 'to blame' accidents, once deliberate attitudinal factors were removed, almost 50% of the accident involvement was accounted for. Their results indicate that a fair percentage of young driver accidents result from driver attitudes, rather than any particular failure in skill. A separate in-depth analysis, conducted by the Norwegian Public Road Administration in Hedmark County (2003), found that the main risk factors for the most serious accidents and injury among young drivers in Hedmark County through the years 2001 and 2002 was speeding, driving when impaired, and not using seatbelts. These violations are related to drivers' attitudes as well as their motivation for safe driving.

The observed accident patterns relating to young drivers identify skill deficits, mainly due to lack of driving experience. They also provide evidence to support the assumption that young drivers have problems handling the behavioural choices that car driving provides and that a lack of high order skills as well as motivation for and attitudes towards safe driving are important risk factors in young drivers' accidents. This relates to the difference between drivers' performance and drivers' motivation and attitudes as important variables for safe driving. Peräaho, Keskinen and Hatakka (2003) see this distinction as parallel to the notions of 'errors' and 'violations' in driver behaviour research (Parker, Reason, Manstead & Stradling, 1995a).

Yet another reason for young drivers' relatively high accident records may be that they tend to overestimate their own driving skills and underestimate the hazards involved in driving (Elvik, Mysen & Vaa, 1997). Young drivers who have taken skid courses have an increased risk of being involved in an accident (Christensen & Glad, 1996; Glad, 1988). These results have led to the suggestion that such courses could result in drivers exaggerating their confidence in their ability to cope with driving on slippery roads. Studies examining the association between skid courses and self-assessment have also supported this hypothesis (Gregersen, 1996; Keskinen, Hatakka, Katila & Laapotti, 1992). Thus, unrealistic self-assessment of driving ability seems to be a possible risk

factor for crash involvement and it may be a side effect of driver training. Also, a realistic view of one's own driving ability may be dependent on driving experience.

The high crash risk among novice drivers may also be a result of poor hazard perception. Sagberg & Bjørnskau (2006) tested the hypothesis that the risk decrease is related to improved hazard perception skills. They concluded that hazard perception played a minor role, but pointed out the interplay between hazard perception skills and other experience-driven factors which in combination constitute driving expertise and bring about a decrease in crash risk.

Young drivers are undoubtedly a vulnerable group in traffic, due to lack of appropriate competence. Hence, it is of crucial importance to continue developing a broad spectrum of countermeasures. Driver training aims at primary prevention of accidents through development of young drivers' competence. The problem regarding lack of driving experience thus represents a paradox. To gain experience, young and inexperienced drivers have to drive; however, driving exposes them and others to risks. Thus, it is necessary to find ways for young drivers to gain experience under circumstances which ensure safety. This thesis focuses on practical driver training, i.e. behind the wheel, formal as well as informal training.

A comparison between formal and informal practical driver training with regard to content is useful in order to clarify which parts of the driver training curriculum are covered by lay instruction and which parts have to be addressed formally and may be mandatory driver training. Formal driver training is steered by official regulations and supervision by governmental authorities, while lay instruction falls outside such control.

1.1.2 Core aim of the thesis

The main aim of the thesis is to examine differences between formal and informal practical driver training as well as the consequences of these differences in traffic safety. The specific aims are to examine these differences with regard to associations with safety attitudes, self-assessment of driving ability, and risk behaviour. These variables are presumed to be influenced by practical driver training. In order to contribute to validation of the measurement instruments used for the outcome variables it is a specific aim of the thesis to examine the association with crash involvement. An additional aim is to examine the contribution from driving experience.

1.1.3 Specific aims

The papers contribute to the present thesis as described below and as shown in Figures 1–3.

Study I: The core aim of Study 1 is to examine the dimensionality of self-assessment of driving ability as well as the psychometric qualities of a new measurement instrument explored for the purpose. The specific aims of the study are to examine: 1) how formal and informal driver training is associated with self-assessment of driving ability; 2) the associations between self-assessment, age and driving experience; 3) gender differences in self-assessment of driving ability; and 4) the association between self-assessment and crash involvement.

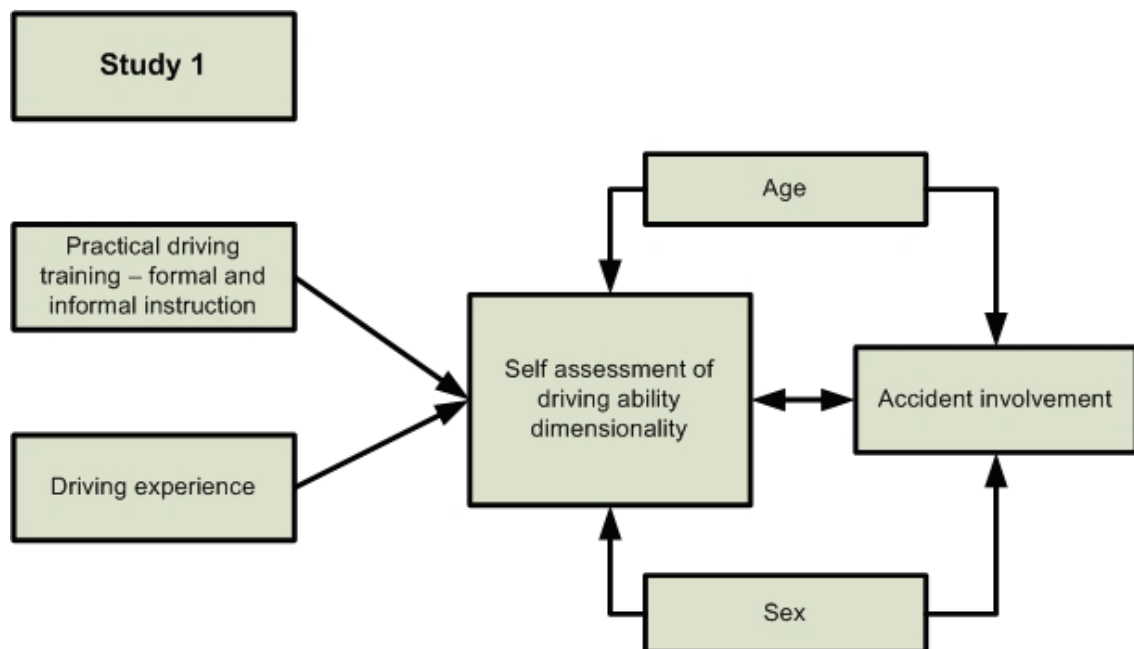


Figure 1: A heuristic working model showing a brief overview of the variables and associations examined in Study 1.

Study II: The main aim of Paper II is to examine associations between young drivers' attitudes, self-assessment of driving ability, and driver behaviour. An additional aim is to examine and compare these variables' associations with formal and informal practical driver training, as well as with crash involvement and driving experience.

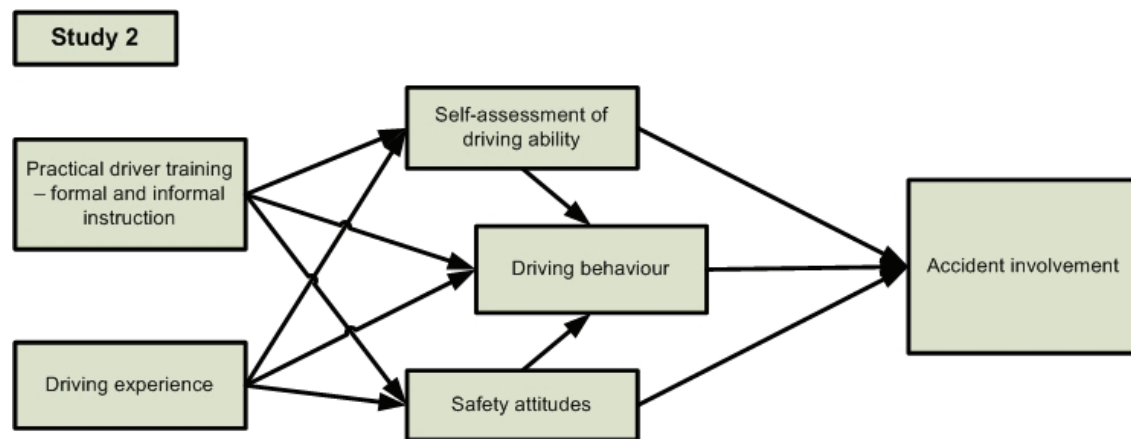


Figure 2: A heuristic working model showing a brief overview of the variables and associations examined in Study 2.

Study III: The aims are 1) to examine and compare the amount and content of lay instruction and professional driver training, and 2) to examine the relation between driving skills, safety attitudes and risk behaviour on the one hand, and driver training on the other hand. The specific aims are to examine the relation between driving skills, safety attitudes and risk behaviour, and the specific didactical characteristics in formal and informal driver training, namely the following predictor variables:

- *Learner characteristics*, including gender, level of education, previous experience with driving other vehicles (such as motorcycles), and motivation with regard to driving skills
- *Frame factors* for learning, including the amount of instruction given through lay instruction and professional driver training. Former research has shown a safety effect relative to a high amount of experience gained through accompanied driving (Gregersen et al. 2000b),
- *Goals and content*, including emphasis on educational elements and particularly risk communication as an issue
- *The learning process*, including also *formative evaluation*.

These aspects of learning and teaching are important in planning, analysing and evaluating instruction, and are included in didactic models in accordance with Bjørndal and Lieberg (1978), Hiim and Hippe (1989) and Lyngsnes and Rismark (2007). The associations will be controlled for driving experience gained after licensing.

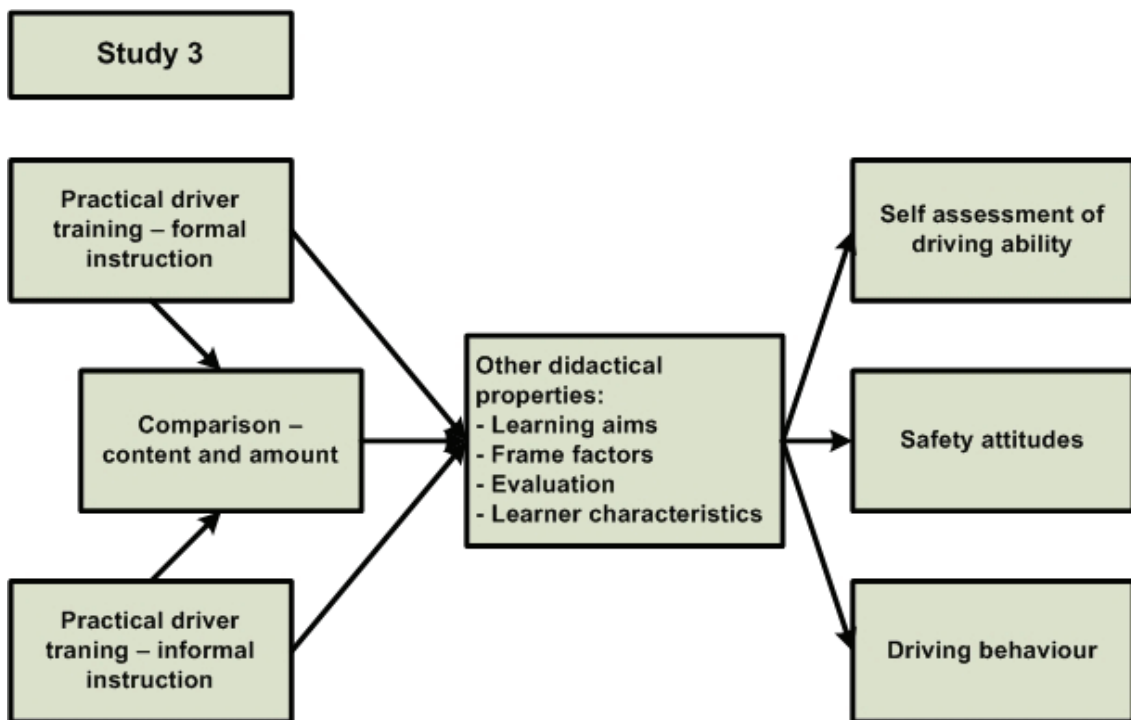


Figure 3: *A heuristic working model showing a brief overview of the variables and associations examined in Study 3.*

Central notions in the models presented above are defined and presented later in this chapter. The theoretical and empirical basis for the aims will be thoroughly described below.

1.2. Theories on accident causation and behaviour in traffic

Driver training as a safety measure has to be considered in light of theories of accident causation and driver behaviour. Driver behaviour theories explain how drivers act in traffic. Despite the fact that most driver behaviour models have been developed aiming at explaining why and how accidents occur, driver behaviour models contribute to descriptions of what kind of competence drivers need in order to tackle road traffic environments in a safe manner. By focusing on the human factor in accidents, driver behaviour models describe how people drive, how they process their information, and also how personality, attitudes and skills influence driver behaviour and in turn influence accident involvement. The demands of competence have to be reflected in the educational goals; in other words, driver behaviour models are useful for educational purposes.

Theories on accident causation and behaviour in traffic are of interest due to the implications for driver training as a safety measure and due to their ability to provide relevant outcome variables for driver training. In accordance with the accident patterns of young drivers, it is of particular interest to assess driver behaviour theories with regard to their relations to important output variables such as self-assessment of driving ability and safety attitudes, as well as self-reported driver behaviour.

The present thesis relates closely to several theories of accident causation and models for acquisition of driving competence, e.g. the skill acquisition model (Dreyfus and Dreyfus, 1986), and the Goals for Driver Education framework, the GDE-model (Keskinen, 1996; Hatakka, Keskinen, Gregersen, Glad & Hernetkoski, 2002; Peräaho et al., 2003) (for further details see the section below). Self-assessment of driving ability as well as safety attitudes and driver behaviour are important notions in the heuristic working models presented above. These terms are more or less apparent in different accident theories and serve as parameters influencing decision-making and risk. In the following, the role of these variables in accident causation will be examined in the elucidation of accident causation theories.

1.2.1 The role of skills in accident causation theories

Self-assessment of driving ability relates closely to the role of driving skills in car driving. Lack of skills is an obvious cause of accidents in car driving. The importance of skills in driver competence is, for example, apparent in the skill acquisition model of Dreyfus and Dreyfus (1986). This model is primarily for the development of driving competence as well as competence within other domains. The skill model assumes driving competence as mainly a form of advanced skills, implying that the problems behind accidents are due to lack of driver skills. Dreyfus and Dreyfus (1986) see car driving as a skill analogous to the proficient dexterity that a highly skilled craftsman has. This view has reference to and is in line with Merleau-Ponty (2002), who suggests that the car may be conceived as a prolongation of the driver's body. A driver may experience the car as a part of the body that is similarly controlled and perceived as are his or her arms and legs.

The skill model may be seen as a model for apprenticeship learning, commensurate with learning in accompanied driving. The skill model is described as five different stages through which skills develop towards continuously more advanced stages. Initially a 'novice' primarily depends on context-free rules to act (Dreyfus and Dreyfus,

1986; Wackerhausen, 1997). The 'advanced beginner' will interpret the rules in light of the current traffic situation and will be able to place the rules into the context. At the most advanced stage, the stage of 'expertise', an expert will be able to perform immediately and intuitively within a domain, based on their response to a given situation. According to Dreyfus and Dreyfus (1986), this will replace reasoned responses. In the skill model we can recognise an unconscious, non-cognitive aspect of judgment and decision-making. The driver is not able to describe the knowledge and skills which constitute the basis for his or her judgment; the characteristic is that the competence as a whole is effective. The Cartesian mind-body dualism is set aside in line with the analysis of Damasio (1994) in his 'Descartes' error'. Dreyfus and Dreyfus (1986) make the mind-body unity explicit in their model. However, the skill model does not contain reference to the motivational aspects of driving. Probably, the basic assumption is that motivation for survival and avoiding injury are sufficient to guide behaviour, and also sufficient to avoid accidents. In the advanced stages of the model it is to be expected that the rules will play a less important role in a driver's performance and hence dependence on the rules will be reduced. Consequently, attitudes towards rule violations may develop in a less than ideal direction, at the same time as more advanced driving skills are acquired. The model of Dreyfus and Dreyfus is further described in Paper II.

The importance of skills are also emphasised by Marek and Sten (1977). There is little doubt that the human being has limitations in the capacity to handle information. The demands of driving as a task are seen as depending on the quality of the other elements in a traffic system. Within the system-theoretical approach (see e.g. Marek & Sten, 1977) the traffic system is regarded as a whole, focusing not only on the driver but also on the road, the traffic environment, and the vehicle. This makes it possible to recognise the importance of adapting the system to the limitations of the driver.

A drivers' ability is described in terms ranging from elementary manoeuvring skills and to more advanced skills such as information processing, which is influenced by driving experience and training, although with limitations according to individual drivers. However, one consequence of this approach is to see the driver more or less as a victim of the system. The demands the driver encounters are seen as a virtually fixed feature of the given system. In order to prevent accidents the system has to be modified. Furthermore, a driver's motivation and intentions are not very well recognised in the system theoretical approach.

When considering a given route, it is easy to understand that the demands of driving will depend on the choices that a driver makes. The drivers themselves are to some extent able to influence the demands of the task by adapting their behaviour to the characteristics of the route in question. For example, driving at high speed through a difficult curve generates higher task demands, while lower speed will make it easier to cope with the driving task. This aspect makes apparent drivers' possibility of adapting their driving to their skills, provided that there is appropriate self-assessment of these skills. Consequently, self-assessment of driving ability relates closely to the role of regulation and calibration of the driving in order to bring the driving into accordance with driving skills. Driving is thereby also a question of the drivers' ability and motivation for making appropriate choices influencing the difficulty of the driving process. Neither the skill model nor the system-theoretical approach differ between accidents as a result of skill deficits and accidents as a result of failures in a driver's motivation and intentions to drive in a safe manner, simply because the latter aspect is overlooked in the models.

In order to capture what may be called the driver's possibility to manage a risk it is necessary to introduce motivation as an important aspect in driving. There is a need to see how a driver may be motivated to drive safely. Thereby, the perspective shifts from what the driver is able to do, to what the driver is willing to do (Peräaho et al., 2003).

1.2.2 Motivation and intention – the role of safety attitudes

Motivation for safe driving and intentions behind different actions in traffic have been emphasised by, for example, Gibson and Crooks (1938), Taylor (1964), Nääätänen and Summala (1974; 1976), Wilde (1982), Fuller (1984; 1988; 2005), and Vaa (2004).

Ajzen and Fishbein suggested in their Theory of Reasoned Action (TRA) that behaviour to a large extent is determined by a person's intention to perform a given behaviour as well as the subjective norm (i.e. the perception of what significant others expect the person to do) (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). In the Theory of Planned Behaviour (TPB) (Ajzen 1988; 1991), this interaction between motivational and social factors was extended with the term 'perceived behavioural control', which refers to people's perceptions of their ability to perform in a given manner. This includes the important aspect that the performance in question has to be under volitional control.

In traffic behaviour research TPB has been used to examine the relationship between behavioural determinants and driver behaviour as, for example, violations (see e.g. Parker, Manstead, Stradling, Reason and Baxter, 1992). Another important contribution from TPB is the statement that the predictor and the effect variables should have the same level of specificity in order for the prediction to be successful (Ajzen & Fishbein, 1980). (See section 1.6 for a more thorough presentation of the relations between attitudes and driver behaviour.)

As can be seen, there are significant differences between system theoretical approaches and motivational approaches in driver behaviour models. In motivational approaches, i.e. models in which a driver's possibility to influence the risk and the demand of the task is emphasised, driving skills are more or less considered to be involved in risk compensation mechanisms, which presupposes that how the driver assesses his or her own skills is a determinant in driver behaviour decision-making (risk compensation: see e.g. Wilde, 1982; Vaa, 2004).

There is a need to integrate the two perspectives. Driving is not solely a question about ability, i.e. what the driver is able to do, nor is it a question only about motivation for safe driving, i.e. what the driver is willing to do. According to Peräaho et al. (2003) this distinction is similar to that of the concept differing between 'errors' and 'violation' in driver behaviour (Parker et al., 1995a; Reason, Manstead, Stradling, Baxter & Campbell, 1990). Errors are more attributable to lack of driving skills such as, for example, limitations in cognitive abilities or limitations in manoeuvring skills and car handling. In contrast, violations represent aspects of driver behaviour determined by motivational factors such as, for example, bad attitudes or lack of motivation for safe driving, normlessness and antisocial motivation. Hierarchical models of driver behaviour represent an approach to deal with both of these aspects of driver behaviour.

1.2.3 Hierarchical models – an integrated perspective

Hierarchical approaches have been used for decades in explanations of human behaviour. Within traffic psychology, hierarchical approaches in the beginning were skills-oriented and focused mainly on performance aspects of driving.

One example of an early hierarchical approach is Rasmussen (1982), who described competence on three different levels: a skill-based level, a rule-based level and a knowledge-based level. The principle is that through automation at the lower levels

cognitive capacity will be released for more complicated decisions at higher levels. With time, more and more of the complex driving task will be automated and be dealt with at the skill-based level. The most complicated and rare actions will remain at the knowledge-based level due to the specificity of the situation. However, at the three different levels in Rasmussen's model driving must still be regarded as a more or less advanced skill. In his perspective failures will be a result of deficiencies in one of the three levels. At the skill-based level failures may occur due to inappropriate automation (acting automatically in situations in which the demands are too complex). At the knowledge-based level cognitive limitations may cause failures.

Also Michon (1985) and van der Molen and Bötticher (1988) analysed car driving on three different levels, in which the driver functions at a strategic level, a manoeuvring level and also a control level, i.e. traffic tasks are seen as hierarchically structured. This strategic level opens for motivational aspects with regard to decision-making in car driving, and represents a step towards a more holistic view, integrating performance and motivation into one model.

With regard to the consequences for driver education, the most recent hierarchical model is the Goals for Driver Education framework, the GDE-model. This model is a development into a framework for the goals and contents of driver education. The cognitive limitations of the human being, apparent in information processing models and also in hierarchical models, are of importance to understanding accidents. In the GDE-model a fourth level is added. The four levels are, from lowest to highest: *vehicle manoeuvring*, *mastering traffic situations*, *goals and context of driving*, and *goals for life and skills for living* (for a more thorough presentation, see Hatakka, Keskinen, Gregersen, Glad & Hernetkoski, 2002; Peräaho et al., 2003).

The level *goals for life and skills for living* links the hierarchy to social cognition models identifying behaviour as an interaction of personal factors, such as attitudes and self-assessment, and the social and physical environment, see for example the Theory of Planned Behaviour (TPB) (Fishbein & Ajzen, 1975; Ajzen, 1991). Hence, the GDE-model represents a link between information processing and system theoretical models on the one hand and motivational models on the other hand. The fourth level has its origin in Keskinen (1996), and is further developed in the European Union project GADGET (Guarding Automobile Drivers through Guidance Education and Technology) (Siegrist, 1999). The GDE-model suggests that the factors on the highest

level are most important from a safety point of view (Peräaho et al., 2003). Moreover, the GDE-model emphasises that the highest levels determine actions and behaviour on the lowest levels in the hierarchical model. Within the GDE framework it is argued that the goals and motives of the driver play a significant role in explaining young drivers' behaviour and accidents (Hatakka et al., 2002). Several studies have given support to the idea in the GDE-model that attitudes and motivation are significant predictors of risky driver behaviour and accidents among young drivers (Clarke et al., 2002; Laapotti, Keskinen, Hatakka & Katila, 2001; Moe, 1999; Parker et al., 1995a).

Thus, there are a multitude of theoretical models stating that actual skills, self-assessment of skills, and motivational aspects such as safety attitudes, predict accidents either directly or through inappropriate decision-making and behaviour. However, it is not known how these parameters are influenced by practical driver training, nor is it known how these parameters as a whole relate to accident involvement. *Consequently, it is an aim of the present thesis to examine the relation between these parameters and driver training, as well as their relationship to accident involvement* (Paper II).

The two most relevant theories with regard to driver training are the skill acquisition model (Dreyfus & Dreyfus, 1986) and the GDE-model (Hatakka et al., 2002; Keskinen, 1996; Peräaho et al., 2003; Siegrist, 1999). As described above, an important difference between the GDE-model and the skill model is that the skill model does not deal with motivational aspects of driving decision-making, while the GDE-model has integrated skills, self-assessment of skills and attitudes at different levels, which is considered to be important in young drivers' accident causation. The GDE-model considers over-confidence to be a possible side effect of skill-oriented driver training and may lead to inappropriate regulation of the driving process due to disproportion between actual and self-assessed driving ability. Even more interesting is the statement in the GDE-model that self-assessment is important at each level in the model. A possible conclusion would then be that self-assessment is more than solely calibration related to driving in specific and continuously developing driving situations: it affects also the strategic and global considerations in drivers' decision-making. Albeit that the GDE-model addresses self-assessment of driving skills to the two lowest levels of the model in the form of calibration, the GDE apparently regards the notion to be wider than that, including also more general self-conceptual constructs. This wide role of self-assessment opens for self-assessment to occur at different levels of specificity, pointing to self-assessment as being a multidimensional construct.

In the skill model, car driving is seen solely as a more or less advanced skill, and educational efforts are limited to driving practice which little by little leads to the development of advanced skills. Attitudes and motivation do not fall within the scope of the skill model. Consequently, the skill model neither is able to explain a well-described phenomenon as risk compensation nor the importance of self-assessment as an element in the regulation of the driving process.

On the other hand, important in the skill model is the view of the mind-body unity and the consequences in decision-making when driving. It may be assumed that decision-making is guided by bodily situated emotions and feelings. Also other driver behaviour models point to the importance of feelings in driver decision-making, see for example Gibson and Crooks (1938), Näätänen and Summala (1974; 1976), Summala (1988), and Fuller (1984; 1988). Rumar (1988), points at the need for a switching mechanism in the transition from skill-based levels to levels at which conscious control are necessary. He tentatively suggests this to be ‘the feeling of risk, or of threat, that causes the switching from automatic to conscious control’. This can be seen partly as a parallel to the ‘somatic marker’ of Damasio (1994) and to the “orienting reflex”, see for example Reber and Reber (2001) (see also Vaa, 2004). It is suggested that the feeling component is preconscious, which is in line with Zajonc (1980). It is, however, in contrast to the common interpretation in information processing models where affect is seen as a result of conscious considerations (Zajonc, 1980). The GDE-model relies on information processing models and in this respect is different from the skill model. In the GDE-model the body is not included in decision-making, as such.

Even though it seemingly has an important role in many of the theoretical approaches there is no identification of a body dimension in existing measurements of driver behaviour, either with regard to safety attitudes or self-assessment of driving ability.

According to the skill model driving competence is ‘situated in the body’. The competence is intuitive. It is reasonable to believe that such a body dimension in driving should be perceived by experienced drivers, and thus linked to self-assessment of driving skills. However, to this author’s knowledge such a dimension has not been shown empirically, despite a bodily based component being present in several driver behaviour models.

The GDE-model assumes self-assessment of driving ability to be a determinant of the regulation of the driving process, partly placed in the lower levels of the model as calibration of the driving. This implies that driving has to be calibrated in accordance with a driver's actual ability. An important question remains: How does a driver perceive his or her actual driving ability? The present thesis takes as its starting point that this perception of ability is an aspect of self-assessment and that ability is perceived as a feeling of what is possible to do and what is not possible to do in a specific driving situation. *Consequently, the present thesis aims to examine self-assessment of driving ability with regard to dimensionality* (Paper I).

However, a possible body dimension as an aspect of self-assessment is interesting as a potential determinant of accident involvement. This is yet another reason to examine the relationship between self-assessment and crash involvement.

The GDE-model assumes also parameters such as attitudes and motivation to be important for road safety. It can be argued that these parameters are hardly influenced by solely practical driver training. It may be that accompanied driving with a lay instructor has a focus other than providing content that aims to influence attitudes. Consequently, it is necessary to supplement practical driver training with formal education designed to influence attitudes and motivation for safe driving. However, safety attitudes may be influenced by practical experience of the safety value of attitudes and behaviour in a practical setting independent of formal education. If so, it is possible that informal driver training, such as lay instruction, may replace formal driver training and making it possible for trainee drivers to rely only on the licensing test, provided it is possible to secure the necessary amount of training. The skill model seems to imply this view, also due to the lack of motivational aspects in the model. *Consequently, it is an aim of the present thesis to examine the differences between practical formal and informal driver training with regard to their association with motivational aspects* (Paper II).

In addition, safety attitudes may be less important as a predictor for accident involvement than assumed by the GDE-model. However, the aim of this thesis is not to test the entire GDE-model empirically. Due to its complexity, the GDE is more of a theoretical framework than a model suited for empirical testing.

To this author's knowledge, self-assessment of driving ability has never been compared with safety attitudes as predictors of accident involvement. The present thesis will carry out such a comparison.

As mentioned above, the GDE-model provides a theoretical framework for goals and content in driver training in order to improve safety effectiveness. The Norwegian driver licensing system takes the GDE framework into consideration when it comes to content of driver training.

Consequently, the present thesis aims to examine differences between formal and informal practical driver training with regard to the subject matter content as well as differences in emphasis of the content in the instruction. The study will also examine the associations between subject matter content and emphasis of content on the one hand and self-assessment, safety attitudes and risk behaviour on the other hand (Paper III).

1.3 Driver training and driving experience

1.3.1 The driver training notion

In most definitions learning is associated with some kind of lasting change and development resulting from experience (see for example Colman, 2001). Learning is also seen as the acquisition of, for example, knowledge, traits, skills, and attitudes. Usually learning is associated with *individual* change. It follows from this definition that learning is associated with changes other than those associated with maturity, temporarily impairment and mood changes or those related to inherited characteristics. The learning process is not observable. It is the learner who gains the elements of change which learning includes. As expressed in the EU project titled Advanced (CIECA 2002): 'It is not the message which is delivered, but the message which is received by the participant(s) that counts'.

In the research literature it is common to use the terms driver training and driver education synonymously. However, there are some distinctions that should be noted. In general, the term education is broad and intellectually based, while training has a more practical purpose, building specific skills and competencies, and is usually given over a short time period (Christie, 2001). In the present thesis the term driver training is used.

To the extent that the term driver education has been used it includes the driver educational system as a whole.

Driver training may be classified in different ways. For the purpose of this thesis it is useful to distinguish between pre-licence and post-licence driver training. Pre-licence driver training takes place before licensing and aims to provide the necessary competence to qualify for a driver licence. This is in contrast to post-licence driver training which aims at improving the competence of drivers who already have a licence. Such training may be a part of a two-phase system in which the driver obtains a full licence after a probationary period including post-licence training measures.

Furthermore, theoretical driver training has to be distinguished from practical driver training. Practical driver training takes place behind the wheel, while theoretical training may be provided either in a classroom or in a car, closely linked to practice. However, it is important to provide a link between theory and practice, i.e. taking into account the mutual relation between theory and practice. The theory learned in a classroom is given meaning when it meets reality in a practical context on the road. Likewise, theoretical elements mediated in a classroom are easier to grasp when a learner has a frame of reference from the practical context.

Yet another distinction has to be made, namely that between formal and informal driver training. Formal driver training is professional driver training. It follows official requirements and regulations with regard to the education of driving instructors and curriculum, including the content of the training, equipment in the car, amount of mandatory training. In informal driver training, or lay instruction, a non-professional person with permission supervises a learner during driving practice. Usually, in Norway, the lay instructor in informal driver training is one of the learner's parents. Most of these driving sessions are not planned in advance, and 61% of them are conducted in combination with other driving purposes, such as shopping and visits (Ulleberg 2003).

One important difference between professional and lay instruction is that it is possible for the content within professional instruction to be regulated and controlled by both the authorities responsible for the quality of driver training and the official systems for licensing, while lay instruction depends more on factors beyond official regulations and supervision. Consequently, issues and subjects defined as important in the driver

training curriculum have to be addressed by formal and possibly mandatory training to the extent that they are not covered by lay instruction.

The present thesis investigates differences between formal and informal practical driver training provided during the pre-licence period as experienced by the learners themselves.

1.3.2 Driver training in Norway

The present thesis focuses on practical driver training. In Norway the driver training system always has been rather extensive and systematic, comprising theoretical lessons and practical training, partly as mandatory lessons. The practical training is a combination of formal and informal driver training, and has had the same position in the driver education system over a period of long time. Most of learners obtain a mixture of both types of training. Until 1995 the age limit for accompanied driving was 17 years. Before 1995 the average amount of informal accompanied driving in Norway was estimated to 974 km (Sagberg & Gregersen 2005). From 1995 unlicensed trainee drivers already from age 16 years were allowed to drive on a road with a lay instructor, while the lowest age at which a license can be held for driving a passenger car is 18 years. Since 1995 it has been a requirement that a lay instructor has at least five years of driving experience. Learners undertake as much formal and informal training as needed to pass the driving test and obtain a licence. The great majority of learners in Norway reduce their costs by supplementing the mandatory and professional training with lay instruction, simply to gain sufficient driving experience prior to taking their driving test. Most drivers in Norway therefore will have experienced both lay and professional instruction. Ulleberg (2003) estimated an average of about 2000 km lay accompanied driving before licensing. This is an increase from studies of Sagberg (2000) who found an average of 1153 kilometres accompanied driving before licensing.

The mandatory parts of professional training were extended in 2005, fully implemented from 2006. The initial basic traffic knowledge course (17 theoretical lessons) is a precondition for learners to start private practical driving with a lay instructor. The mandatory skidpan course includes 2 theory lessons in the classroom and 2 lessons practical driving behind the wheel. The last part of the mandatory driver training is the on-the-road safety course (4 theoretical and 9 practical driving lessons). In total, this amounts to 34 mandatory training lessons, 23 of which are theoretical lessons while 11 lessons are practical driving behind the wheel. In addition, there are also 2 evaluation

lessons in which the learner and the professional driving teacher together assess the competence that the learner has acquired, and what aspects have to be regarded as developing.

The Norwegian model includes a detailed syllabus describing progression and content as well as the use of teaching methods. The traffic safety objective is apparent in the teaching plan as a whole. Elements in the syllabus which are considered to be beyond the scope of the driving test are covered under mandatory training (Norwegian Public Roads Administration, 2005). Elements in the syllabus which are presumed possible to test appropriately in the practical or theoretical tests are addressed by the learner choosing to how to acquire the necessary competence.

The new teaching plan was launched in Norway during 2005, and fully implemented from 2006. Hence, a few of the youngest respondents may have followed the new teaching plan. However, only practical driver training other than mandatory lessons is addressed in the study. This element in the training is not changed under the new system.

1.3.3 Effects of formal and informal training

Educational efforts will usually be considered successful if the learning objectives are met and students pass the exams or tests set at the end of the course. Accordingly, the most important short-term aim with driver education is for learners to pass the driving test. Also, for students, access to independent driving is of great importance and passing or failing the exam will influence how they perceive the success of the training provided. However, driver education has a wider purpose, due to the expectations to produce road safety effects. Crash involvement is a difficult output variable for measuring the effects of driver training. The individual level of accident risk is very low, indicating that accidents are not a suitable effect variable with which to measure the impact of driver training. Other safety-related variables, such as self-assessment of driving ability, safety attitudes and risk behaviour, are easier to measure in a reliable way at an individual level, provided that the context is neutral and the test is carried out anonymously. Hence, these variables may be used as substitutes for the variable 'crash involvement', provided that they result from driver training and that they are closely associated with situations where crash involvement is an outcome.

In the following, the research status regarding the relation between driver training and these output variables will be described.

Training and self-assessment

Several studies have identified overconfidence as a problem among young drivers (e.g. Deery, 1999; Gregersen, 1996; Katila, Keskinen, Hatakka & Laapotti, 2004; Matthews & Moran, 1986; McKenna, Stanier & Lewis, 1991; Spolander, 1983). However, drivers in general in many countries assess themselves to be more skilled than the average driver, indicating that overconfidence may be a problem also among experienced drivers (Delhomme, 1991; Goszczynska & Roslan, 1989; McCormick, Walkey & Green, 1986; Svenson, 1981).

Research into mandatory skid courses has shown that skid training courses may increase the accident risk (Christensen & Glad, 1996; Glad, 1988). Glad (1988) suggested that an explanation could be that the courses led to an overestimation of the participants' own driving ability, and a result of this would be decreased safety margins, leading to higher accident risk. Keskinen et al. (1992) found that course participants in Finland had higher self-assessment scores of their own driving skills following skid courses. Gregersen (1996) carried out an experimental study on skid courses, comparing one group of drivers who attended a training course in manoeuvring skills on slippery conditions with another group of drivers who attended a course where the curriculum focused on developing insight into the safety problems attached to such conditions. Skill-trained drivers assessed their skills as better than insight-trained drivers did. However, the study showed no differences between the two groups with regard to actual driving skills performed after attending the two courses. Thus, an overestimation of one's own driving skills may be a result of skill-oriented skid training courses, while insight-oriented driving programmes may discourage such overconfidence. Senserrick and Swinburne (2001) reported reduced confidence in driving ability among young men who attended an insight driver training programme. This programme was aimed to provide greater insight and awareness of potential risks when driving, thereby targeting issues of overconfidence rather than traditional advanced driving skills.

Groeger and Brady (2004) examined the association between self-assessment and driver training. They found that learner drivers' self-assessment of driving ability increased as their amount of training grew. However, their accompanying teachers considered that

their actual ability increased in line with the amount of training, giving reason to question the tendency of young drivers' to overestimate their own driving skills reported in former research.

In conclusion, it is possible through driver training to influence young drivers' assessment of their own driving ability. Overconfidence may be a side effect of skill-oriented driving strategy, but it may be avoided provided the training is appropriately designed to prevent overconfidence (Gregersen, 1996). Hence, self-assessment of driving ability seems to be a relevant outcome variable for different types of driver training, and it might serve as a substitute for crash involvement as an outcome variable for the effect of driver training.

Thus, the present thesis examines the associations between self-assessment and crash involvement.

Driver training, attitudes and driver behaviour

Attitudes are important as a possible predictor of driver behaviour. To this author's knowledge the association between practical driver training and safety attitudes as well as risk behaviour have been sparsely examined.

In an evaluation of a pre-licence driver education programme in Victoria, conducted at rural secondary schools, Haworth, Kowadlo and Tingvall (2000) compared the effects of pre-licence driver education programmes at rural secondary schools which included an in-car component (driving a car in an off-road environment) with the effects of pre-driver education programmes without this component. No statistically significant differences were found in respect to accident or offence record or in respect to driving-related attitude or behaviour measures. However, very few studies have shown driver training interventions to be effective.

Strang, Deutsch, James and Manders (1982) compared four groups of young drivers, and reported that two off-road trained groups were significantly better on attitude scale scores (more positive) than the control group and the on-road group. However, a two-year follow-up showed no statistically significant differences between any of the groups in terms of crashes (Christie, 2001). Gregersen et al. (2000a, 2000b) evaluated the implementation of a 16-year age limit for practicing with a lay instructor in Sweden. The results showed that despite significantly increased amounts of driving practice and

improved safety due to the reform, the learners' knowledge and safety attitudes did not improve.

The above-mentioned study by Senserrick and Swinburne (2001) was an evaluation study of an insight-training post-licence programme targeting recently licensed drivers. The course avoided focusing on manoeuvring skills in favour of focusing on attitudinal-motivational skills, and aimed at raising drivers' awareness of the dangers connected to their driving. The results showed that confidence in driving ability did not increase and the authors reported improved safety attitudes with a reduced likelihood of speeding. The driver training programme was also shown to have a positive role in minimising dangerous driver behaviour.

Nyberg (2007) found that an insight-based approach used in a course given in safety halls (exhibitions arranged to demonstrate important safety aspects connected to car driving) had a positive influence on learner drivers' knowledge of and attitudes towards the use of car safety equipment such as, for example, safety belts.

Another insight-based programme targeting young licensed drivers was conducted by Nolen, Engström, Folkesson, Jonsson, Meyer, and Nygard (2002) and revealed the influences on young drivers' attitudes regarding seat belts and safety margins. With regard to behaviour, the study showed the long-term effects on self-reported use of seat-belt, distance keeping, overtaking, and perceived ability to drive within safety margins. Masten and Chapman (2004) compared a CD-ROM/Internet and workbook home-study driver education programme with courses provided in a classroom. The results tended to favour the home-study programme with regard to knowledge and attitudes scores. The brief conclusion is that it may be possible to influence safety attitudes significantly through education based on insight programmes. However, the relationship between *practical driver training* and development of safety attitudes has been sparsely examined.

Consequently, the present thesis aims to analyse the associations between practical driver training and safety attitudes as well as with self-reported driver behaviour (Paper II).

Associations between formal driver training and accident involvement

Evaluation studies of driver training with regard to the association with crash involvement have included different types of such training, i.e. post-licence training,

pre-license training, theoretical lessons, practical driver training, and also complete systems of driver training and licensing. In order to gain an overview of driver training as a measure of road safety, the present thesis will briefly reflect on the current research status in this field as a whole.

It is a challenge to prove the effectiveness of driver training in terms of reduced crashes. Possible effects especially of driver education provided in high schools may be offset by increased exposure due to earlier licensing (see for example Lund, Williams & Zador, 1986; Roberts, Kwan & the Cochrane Injuries Group Driver Education Reviewers, 2001).

Research to date gives no basis for decisive conclusions regarding the effect of driver education on crash risk. Many reviews conclude that formal driver education cannot be considered an effective crash countermeasure (for example Christie 2001; Vernick et al. 1999). Other reviews have concluded that education has a modest effect (for example Henderson 1991; Ker et al. 2005), or may even contribute to increased risk (e.g. Mayhew & Simpson, 2002; Elvik & Vaa, 2004).

There may be many reasons for these mixed results. Negative results may be caused by a tendency to earlier licensing and increased exposure owing to required driver education (Mayhew & Simpson, 2002). Another reason may be that the amount of driver education has been too limited (Engström et al. 2003). And yet another may be that crash involvement is a problematic outcome variable for the effect of driver training. (For a discussion of this problem, see section 4.2.2.) Other reasons may be that the driver training has focused on the wrong aspects or does not have the best content. Teaching is a complex process involving different and related phenomena expected to influence the learning process and the value of the training (Strand & Kvernbekk, 2000). There is a need for further, more detailed research on specific aspects of educational processes, such as in-car teaching (Rismark & Sølvsberg, 2007; Lonero, 2008; Gandolfi (2009) and didactical aspects of teaching and learning such as learning objectives, amount of teaching, content, methods, evaluation and testing (Elvik et al., 1997). Identifying possible qualities in the training that are associated with safety relevant outcomes is necessary in order to achieve the educational goal of greater traffic safety.

The important question is how to identify influential elements in driver training. There are studies within driver education showing promising results with regard to safety effects. Glad (1988) evaluated the effects of darkness driving training as part of Phase 2 driver training in Norway. The results showed that male drivers had significantly fewer accidents in the dark compared to male drivers who had not taken the course. For female drivers there was no significant effect. As mentioned above, the skidpan part of the same Phase 2 driver training course in Norway resulted in an increase in the number of accidents among young male drivers in slippery surface conditions. In this part of the course the approach was to improve the specific driving skills on slippery surfaces. Thus, the Norwegian Phase 2 education system demonstrated the difference between skill-oriented and insight-oriented approaches as shown by, for example, Gregersen (1996).

Pannacci and Margue (2000) examined the impacts of driver education after the implementation of a two-phased licensing system in Luxembourg. They found a 34% reduction in drivers involved in fatal crashes after three years compared to the level three years before the implementation of the system. For all other drivers the corresponding reduction was 24%, indicating that driver education has a positive effect on accident involvement. Carstensen (2002) evaluated a change in the driver education system in Denmark. The curriculum was changed to an improved emphasis on defensive driving and hazard perception. Based on the findings from the Carstensen evaluation, Nyberg (2007) estimated a decrease in crash involvement of 7–21% among young drivers compared to older drivers.

There is a lack of empirical support for the suggestion that skill-oriented off-road training programmes improve traffic safety. Some studies have even demonstrated increased accident involvement, see for example Glad (1988). This may be due to increased confidence, particularly among young males. However, it is evident that insight driver training programs may influence safety attitudes and self-reported behaviour (Nyberg, 2007; Senserrick and Swinburne, 2001). The traffic safety effect depends on these variables' association with accidents. *The present thesis aims to examine the relation between self-assessment of driving ability, safety attitudes and self-reported driver behaviour on the one hand, and accident involvement on the other hand (Study II).*

Effects of supervised practice on safety

According to Simons-Morton and Ouimet (2006) there is a need for further studies examining the effects of supervised driving practice on driving performance after licensing. McCartt, Shabanova and Leaf (2003) reported a mean value of 341 miles (550 km) of driving with a permit for supervised driving, but did not find any safety effect. Similarly, in a Norwegian study, Sagberg (2000) did not find any increase in safety after lowering the age limit from 17 years to 16 years as required age to be allowed to drive under supervision. However, the amount of supervised driving did not increase significantly after lowering the age limit for supervised practice. Consequently, solely lowering the age limit is not a sufficient precondition for increased accompanied driving. The mean amount of driving with a permit for supervised driving in Norway was approximately 1150 kilometres. Learner drivers who practiced more had lower crash involvement after licensing.

Sagberg (2002) found that there were thresholds for the safety effect of informal accompanied driving. He showed that the accident risk initially grew along with increased accompanied driving up to a certain level, but it then decreased rapidly once this level was reached. He made a conservative estimate and recommended an increase in supervised driving up to a level of 4000 kilometres, as a threshold level for gaining a desired safety effect from lay accompanied driving.

However, Page, Ouimet and Cuny (2004) did not find any safety effects resulting from an optional programme in France. Learners received a 24-hour training programme prior to a 1–3 year period of accompanied driving. The study showed no differences with regard to crash involvement between learners in this group (who drove an average of *c.*5000 kilometres under parental supervision) and learners who received only professional driver training.

Forsyth (1992) showed that learners who had some driving experience in addition to the professional instruction were more likely to pass their driving test. Bjørnskau (2003b) found that candidates who received many professional lessons had less informal driving practice and thus were more likely to fail their driving test.

In Sweden the minimum age for accompanied learning in 1993 was lowered from 17½ years to 16 years. The purpose was to give learner drivers more driving experience through supervised informal practice. Gregersen et al. (2000a, 2000b) showed that the

amount of accompanied driving more than doubled to a mean of 117.6 hours. The traffic safety effect was measured through a two-year follow-up study. There was a general reduction of approximately 15% in the accident risk (accidents per 10 million km) among novice drivers. However, the resulting difference in accident risk for those who utilised the lower age limit was approximately 40% compared to the situation before the reform and 24% compared to those who did not choose to avail themselves of the opportunity to practice from 16. These effects include adjusted effects of confounding factors such as socio-economic status. In an evaluation of the 16-year limit for supervised practice in Sweden, Gregersen and Nyberg (2002) showed that the new system with a greater amount of accompanied driving over an extended training period influenced neither safety attitudes nor self-assessment in a negative way.

Simons-Morton and Ouimet (2006) argued that:

... parents would have ample opportunity to impress their children with the importance of safe driving behaviour. However, ... it is unknown how much supervised driving practice is needed for higher order skills to develop, or whether practice is enough.

Results from Sagberg and Gregersen (2005) indicated that accompanied driving was more effective in reducing the subsequent crash risk than driving alone.

Christie (2001) carried out an extensive review of driver training as a possible road safety measure. He concluded that young drivers need on-road driving experience and suggested that the accumulation of an on-road 'experience bank' (through supervised practice) is perhaps the major potential contributor to reduced crash risk in solo driving.

However, so far it has not been clarified which elements in supervised driving practice contribute to a positive safety effect other than higher amounts of driving experience. *The present thesis aims at analysing the differences between formal and informal practical driver training in order to clarify whether other variables may also contribute to safety effects.*

1.3.4 Effect of driving experience on safety determinants

Driving experience and self-assessment

Young drivers have expressed a higher level of confidence about their driving ability compared to elderly drivers (Katila et al., 2004; Keskinen et al., 1992; Matthews & Moran, 1986). The National Highway Traffic Safety Administration (NHTSA) in the USA found young drivers to have higher levels of self-assessment than other drivers had (Karlaftis, Kotzampassakis & Kanellaidis, 2003; NHTSA 1998). This association between age and self-assessment may be due to increased driving experience. For instance, Lajunen and Summala (1995) found that development of driving skills (measured as self-assessment of driving skills) was associated with driving experience. Similarly, Goszczynska and Roslan (1989), Katila et al. (2004) and Groeger and Brady (2004) found a positive association between self-assessment and driving experience. In addition, Spolander (1983) found a positive association between self-assessed skills and driving experience, although driving experience only influenced the skill dimension, not the dimension which he called 'safety orientation'. Lajunen and Summala (1995) and Lajunen, Corry, Summala and Hartley (1998) showed that experienced drivers expressed higher levels of driving ability, i.e. better skills compared to less experienced drivers.

The studies presented above have shown that there is a positive association between driving experience and self-assessment of driving ability. Thus, practical driver training may lead to higher levels of confidence among learners with ample amounts of practical driver training before licensing.

Effects of driving experience on safety attitudes and risky behaviour

It is well known that driving experience contributes to safety (Gregersen et al., 2000a, 2000b; Mayhew et al., 2003; OECD, 2006; Sagberg, 1998; 2000). This effect may result from the development of essential driving skills, or it may be due to a positive association between driving experience and safety attitudes. There is evidence for a positive association between safety attitudes and safety (see for example Iversen & Rundmo, 2004). Risky driving behaviour has been found to be associated with crash involvement (Cooper, 1997; Iversen & Rundmo, 2004; Parker et al., 1995a). Thus, it may be that driving experience contributes to the development of safety attitudes and less risky behaviour through drivers experiencing the extent to which different driver behaviour may be safety effective or not. Lajunen and Summala (1995) found that

driving experience was associated with less safety and rule-oriented driving. Forsyth, Maycock and Sexton (1995) showed an increase in the number of speed violations among drivers during the first three years of gaining their licence. Sagberg and Bjørnskau (2003) revealed that the number of violations increased with driving experience among young drivers. It may be that novice drivers have the most ideal safety attitudes at the time when they obtain their license and later develop their attitudes in a less than ideal direction.

Hence, it is of current interest to clarify further the relationship between driving experience, safety attitudes and violations among young drivers. This may contribute to a comprehension of the mechanisms underlying the safety effect of driving experience. If driving experience has a negative influence on safety attitudes, it may be necessary to compensate for this through educational measures targeting young drivers' attitudes particularly. *Accordingly, it is an aim of the present thesis to examine the relationship between driving experience on the one hand, and safety attitudes and risky driving behaviour on the other hand.*

Driving experience and crash involvement

The above-mentioned study by Sagberg and Bjørnskau (2003) also showed that the risk level was significantly reduced during the first nine months after licensing. This may be in contrast to results from research by Parker et al. (1995a) which showed significant positive correlation between risk behaviour and risk. Sagberg (1998; 2000) observed a reduction in the number of crashes per 1000 drivers by *c.*50% during the first eight months after licensing compared to the initial risk. Several other studies have supported this finding. Results from Sweden (Gregersen et al., 2000a, 2000b) have also shown a clear reduction. In Canada (Mayhew et al., 2003) and Germany (OECD, 2006), a rapid and substantial reduction has been observed. It can be argued that the strong decrease in crashes taking place during such a limited time span indicates that the risk reduction may be a result of the importance of driving experience as a main factor in the development of driving competence. However, there has been considerable debate on the question of whether this decrease relates to age or to driving experience. Engström et al. (2003) estimated the relative contribution of age-related factors to account for 30–50% of the accident reduction, while experience-related factors accounted for 50–70%. In American studies, age has generally been found to be of higher importance. Engström et al. (2003) suggest this is a result of the low age limits at which a license can be obtained. In the majority of states in the USA, 16 years is the age limit for

obtaining a license; while in Europe an 18 years age limit is common. The OECD (2006) concluded that driving experience is the more important of the two factors, and that lack of driving experience is one of the basic factors contributing to young drivers' crash involvement.

1.4 Definitions

1.4.1 Self-assessment of driving ability – definition

Self-assessment of driving ability reflects a driver's view of his or her own driving ability. Consequently, self-assessed driving ability is a subjective term which has to be distinguished from actual driving ability. Actual ability is the objective ability, reflecting exactly what the driver in question is able to perform in a given driving situation. Hence, when measuring self-assessment of driving ability we seek to capture not the person's actual driving ability, but the self-perceived driving ability. The person in question may express an ability which he or she knows is not true, but the ability is expressed as better than perceived due to other reasons, such as, for example, a need for better self-presentation. Consequently, at least three different conceptions may be reflected in measured self-assessment of driving ability: 1) the driving ability that the person in question wishes to express to others, 2) the driving ability the person in question honestly believes he or she has attained, and 3) the person's actual ability. The differences between the second and third conceptions do not necessarily indicate biased measurement. Correct measurement is aimed at capturing the second concept rather than the first. *In the present study a new measurement instrument aimed at capturing the driving ability the person in question honestly believes he or she has attained is evaluated.*

1.4.2 Safety attitudes – definition

According to Allport (1935), 'an attitude is a mental and neural state of readiness, organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations with which it is related'. However, the attitude conception includes reactions to something or someone which are evaluated as favourable or unfavourable, which implies that an attitude may be positive, neutral or negative (Myers, 2008). When it comes to traffic safety it is common to use the term safety attitudes, which in this context means the attitude towards conditions, circumstances, situations, decisions, and behaviour related to traffic safety. For the present study, safety attitudes are measured by self-reports. The respondents were asked

to indicate to what extent they agreed or disagreed with statements reflecting favourable or unfavourable traffic safety attitudes. Thereby, the definition of attitude is in accordance with Myers' definition which implies that an attitude may be positive, neutral or negative.

1.4.3 Self-reported driver behaviour – definition

Intuitively, self-assessment of driving ability as well as attitudes should be related to crash involvement due to their influence on driving behaviour. In a wide sense, behaviour refers to the actions or reactions of an object or organism as responses to its environment. It follows from this definition that behaviour is determined by the context and the situation. Nevertheless, how individual behaviour is shaped will also be a result of individual conditions and preconditions. This dependence on the context as well as individual premises is apparent in the TRA (Theory of Reasoned Action), in which intentions to perform behaviour may be predicted with high accuracy from attitudes towards the behaviour, subjective norms, and perceived behavioural control (Ajzen 1991). In a driving context, perceived behavioural control is related to a person's perception of skills and their ability to deal with the challenges which the driving conditions provide.

It follows from this distinction between skills and attitudes that driver behaviour may result in accidents both due to *errors* and due to *violations*. This distinction appears in the Driver Behaviour Questionnaire (DBQ) (Reason et al., 1990). Errors (i.e. unintended actions) may relate to deficiencies in judgmental processes (mistakes) as well as in inferential processes (lapses), leading to three dimensions in aberrant driver behaviour: violations, mistakes and lapses. Åberg and Rimmö (1998) found support for the conclusion that violations and errors are two separate dimensions in driving behaviour. However, in their sample there was an empirical basis for splitting the lapses into two new factors: inattention errors and inexperience errors. Studies have shown that it is the violation dimension rather than the error dimension which is associated with accident involvement (see for example Parker et al., 1995a). In the present study the instrument from Åberg and Rimmö's (1998) study is applied.

1.5 The role of self-assessment of driving ability as a determinant of driving behaviour and accident involvement

Self-assessment of driving ability may be important in drivers' choice of behaviour. Driving has been hypothesised to be a self-paced task (see for example Summala, 1988; Taylor, 1964), i.e. drivers may influence the demands of the driving task through their behavioural choices. Ideally, drivers' ability should match the demands of the driving situation they are confronted with. However, it is reasonable to assume that a driver's choice of driver behaviour corresponds to what he or she assesses to be within his or her own capabilities. When demands and abilities correspond, driving behaviour is in balance and considered to be calibrated (Kuiken & Twisk, 2001; Milech, Glencross & Hartley, 1989). Thus, overestimation of driving ability may lead to inappropriate regulation of the driving process, resulting in increased accident risk (Spolander, 1983). Accordingly, a driver's assessment of his or her own driving ability may have an impact on traffic safety (see for example Brown & Groeger, 1988; Glad, 1988; Gregersen, 1996; Sundström, 2008; Mynttinen, 2010). To be able to test the overestimation hypothesis, the relation between self-assessed driving ability and actual driving ability has to be compared. In the present thesis previous accident involvement is applied as an indicator of actual driving skills.

The relationship between self-assessment of driving ability and crash involvement is sparsely examined in the research literature, despite the assumed importance for young drivers' high crash risk. *Thus, the present thesis aims to examine the relation between self-assessment and self-reported behaviour as measured in Åberg and Rimmö (1998) as well as in relation to accidents.*

1.6 The attitude-behaviour relationship and its relationship to safety

The attitude-behaviour relationship is essential in both the TRA model (Theory of Reasoned Action) and TPB model (Theory of Planned Behaviour) (Ajzen, 1991; Fishbein & Ajzen, 1975). Attitudes and behaviour are correlated provided they are measured at a corresponding level of specificity (Ajzen, 1991; Ajzen & Fishbein, 1977; 2005; Kraus, 1995). In addition to attitudes, social norms are considered to be an important predictor in TRA. In TPB, perceived behavioural control is included as a predictor in addition to the other two factors as determinants of intention, which in turn are strongly associated with future behaviour.

Several studies have confirmed that there is a strong association between safety attitudes and risk behaviour in traffic (Lajunen & Summala, 1995; Parker et al., 1995a). Iversen and Rundmo (2004) found that attitudes towards traffic safety are associated with involvement in risk behaviour, especially attitudes concerning rule violations and speeding, as well as other forms of reckless driving. They also found a tendency for younger respondents to have more negative attitudes towards safety than other drivers. Ulleberg and Rundmo (2002) found that the attitude dimensions explained 50% of the variance in self-reported risk-taking behaviour. In addition, their study showed that self-reported risk behaviour was also a significant predictor of accidents. *The present thesis hypothesises that there is a positive association between safety attitudes and risk behaviour as well as with accidents.*

1.7 The relationship between self-reported driving behaviour and road safety

Among human factors, behaviour has been proven to be a main predictor of accident involvement. Rundmo (2002) showed that risk behaviour on the job predicted accidents and near-misses. In traffic safety several studies have shown that there is a significant association between risk behaviour and crash involvement (see for example Elander, West & French, 1993). Also, Hatakka, Keskinen, Katila and Laapotti (1997) found that risk behaviour was significantly associated with accidents and traffic rule violations registered by the police. Parker, West, Stradling and Manstead (1995b) found that the number of accidents was related to self-reported behaviour as it was measured by means of the Driver Behaviour Questionnaire. Cooper (1997) found that excessive speed violations were associated with crash involvement. Put simply, the choice of behaviour is a main contributor to risk in traffic. Determinants of how drivers choose to act should therefore primarily be important as determinants of risk in terms of their influence on driver behaviour. *Accordingly, the relationship between self-assessment of driving ability, safety attitudes, self-reported driver behaviour, and crash involvement will be examined.*

2. Method

2.1 Sample

This thesis is based on a self-completion postal questionnaire survey. The respondents were a sample of the Norwegian population's young drivers aged 18–20 years. A total of 4000 persons were randomly drawn from the official driver licence registry AUTOSYS. They all held a driving licence for passenger cars. The minimum age for holding a driver's licence in Norway is 18 years. The data were collected during autumn 2005 and spring 2006. A total of 1419 respondents replied to the questionnaire, and 167 questionnaires were returned due to unknown addresses. The overall response rate was 37%. Analyses showed that the sample of respondents was closely representative of the population as a whole. The respondents consisted of 721 women and 698 men (50.8% and 49.2% respectively). According to Statistics Norway the actual distribution in the population is 49.6% women and 50.4% men. A total of 13% of the respondents were from the four largest cities in the country. According to available licensing statistics from The Norwegian Public Roads Administration this very closely reflects the actual proportion of 18 year olds licensed in 2005: 13.4% were from the four largest cities. The extent to which the sample is representative is examined in depth in Paper II.

2.2 Measures

The three papers are all based on the same questionnaire. The various measures are only described in general terms here. A more detailed description is provided in the papers.

2.2.1 Background variables

The demographic variables included age, sex, geography, point in time when licensed, driving experience, and also education, including O-Level grades in languages, mathematics and gymnastics. Driving experience was measured by asking how many kilometres the subjects drove per month, and how long they had held a licence.

2.2.2 Driver training variables

The respondents were asked to assess the amount of driver training with a lay instructor as well as the amount of driver training taken with a professional driving teacher. The questionnaire measured two aspects of formal and informal practical driver training.

First, the respondents were asked to compare how they experienced emphasis on the different aspects of content in their driver training, and then they rated items of relevance with regard to educational methods and didactical issues.

2.2.3 Safety attitudes

An 18-indicator Norwegian measurement instrument was used to measure attitudes towards traffic safety (Iversen, 2004; Iversen & Rundmo, 2004).

2.2.4 Self-reported driver behaviour

In order to measure self-reported driving behaviour, Åberg and Rimmö's (1998) 32-items instrument was applied. The measurement instrument from Åberg and Rimmö was based on the driver behaviour questionnaire (DBQ) generated by Reason et al. (1990), although extended with items constructed to fit a Scandinavian context.

2.2.5 Self-assessment of driving ability

To measure self-assessment of driving ability, a 31-item measurement instrument developed for the purpose of the thesis was applied. The questionnaire was based on two other questionnaires aimed at measuring self-assessment of driving ability (Gregersen & Nyberg, 2002; Spolander, 1983). A further 18 items were explored. The procedure and reasoning behind the instrument are described in Paper I.

2.2.6 Accident involvement

The respondents were asked about any crash involvement during the first six months after licensing, and thereafter for the next six-month period and so forth. To avoid any tendency of under-reporting crash involvement it was emphasised that all crash involvement should be reported, regardless of who was responsible for the crash. Also crashes involving only material damage were reported.

2.3 Statistical analysis

Principal Component Analyses (PCA) with Varimax Rotation were applied in order to examine the dimensionality of self-assessment of driving ability, safety attitudes and self-reported driver behaviour (Papers I, II and III).

Due to the fact that the measurement instrument for self-assessment of driving ability was a new instrument, the Linear Structural Relation (LISREL) analysis programme (Jöreskog & Sörbom, 1993) was used for additional confirmatory factor analyses in Paper I, in order to strengthen the basis for assessment of the dimensional structure. LISREL makes use of the covariance matrix of observed variables as basis for analysis and provides options to test the goodness-of-fit of models. Various fit indexes were used, including the goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit-index (CFI), and the root mean square error of approximation (RMSEA). The higher the GFI, AGFI, and CFI, the better the model fits the data. A value of 1.0 represents the theoretical exact fit between the model and the data, which of course is an unrealistic result to obtain. An applied cut-off criterion above .90 is a default value for claiming satisfactory fit for these three measures. However, with regard to the CFI, Hu and Bentler (1999) have concluded that it should be rather close to .95 in order to claim a good fit between the hypothesised model and observed data. The root mean square error of approximation (RMSEA) has a theoretical value of 0.00 for exact fit between the model and the data. Steiger (1989) has suggested that an RMSEA below 0.10 represents a reasonable fit, and values below .05 represent a very good fit. Browne and Cudek (1993) consider an RMSEA below 0.08 to indicate a good model fit.

Cronbach's (1951) alpha coefficient was applied to evaluate the homogeneity of the items and to determine the reliability within the self-assessment dimensions as well as the safety attitudes and driving behaviour dimensions. According to Nunally (1978) an alpha-value of 0.70 or higher is considered satisfactory, hence this criterion was applied in the thesis. Average item-total correlations (Pearson's r) were calculated in Paper I and Paper II as a part of the assessment of the reliability of the self-assessment, attitudes and driver behaviour measurement instruments.

Multiple regression analyses were carried out in order to examine the associations between self-assessment dimensions on the one hand and age and driving experience on the other hand (Paper I). Multiple regression analysis was also applied to examine the association between practical driver training and driving experience on the one hand and self-reported behaviour, attitudes and self-assessment of driving ability on the other hand (Paper II). Multiple regression analyses were also applied in order to examine the importance of self-assessment and attitudes in dimensions of self-reported behaviour (Paper II). Negative binomial regression was conducted to examine the relation

between self-assessment, safety attitudes and risk behaviour on the one hand and crash involvement on the other hand (Paper II). Correlations (Pearson's r) and multivariate analysis of variance (MANOVA) were used to examine the association between self-assessment on the one hand and driver training, driving experience, gender, and risk on the other hand (Paper I).

In order to assess the significance of differences in variance in the priority given to educational elements between formal and informal driver training, as rated among learner drivers a paired samples t-test was applied in Paper III. The statistical analysis compared means between the respondents' rating of professional instructors compared to lay instructors. Hierarchical regression analysis was conducted to examine the relationship between outcome variables and the groups of predictor variables determined by the specific didactical categories described in the specific aims in paragraph 1.1.3. Regression analyses were also applied to examine the association between priority variables, amount variables and interaction effects as predictors on the one hand, and attitudes, self-assessment of driving ability and self-reported risk behaviour as criterion variables on the other hand.

3. Results

3.1 Paper I: Associations between self-assessment of driving ability, driver training and crash involvement among young drivers

The core aim of Paper I was to examine the dimensionality of self-assessment of driving ability as well as the psychometric qualities of a new measurement instrument explored for this purpose. An additional aim was to examine associations between self-assessment of driving ability, driver training and crash involvement among young drivers, and also differences in self-assessment due to gender and age. The structure of the instrument was considered to be multidimensional, indicating that different dimensions of self-assessment of driving ability would be reflected in the instrument. Four factors were identified on the basis of an exploratory Principal Component Analysis (PCA). The results showed the following four dimensions: general driving ability, safety orientation, the body dimension, and specific task skills. These dimensions accounted for 52.98% of the variance in self-assessment. Additionally, a confirmatory factor analysis conducted in LISREL demonstrated a satisfactory fit between the data observed and the suggested four-factor model structure. The reliability and validity of the measurement instrument were found to be satisfactory. The highest level of self-assessed driving ability was found among male respondents, experienced drivers, drivers who had had a high amount of informal driver training, and drivers with the lowest levels of accident risk. Young drivers seemed to have a fairly realistic view of their own driving ability. The better the respondents perceived their driving ability to be, the lower their level of risk proved to be. The findings therefore may indicate that overestimation of driving skills is a minor safety problem among young drivers, and that skill training is an important part of driver training to ensure safety.

3.2 Paper II: Associations between driver training, determinants of risky driving behaviour and crash involvement

The core aim of Paper II was to examine associations between young drivers' attitudes, self-assessment of driving ability and driver behaviour. An additional aim was to examine these variables' associations with formal and informal practical driver training, as well as with risk and driving experience. The results showed that there were weak, but significant, associations between driver training on the one hand, and traffic safety attitudes and risky driving behaviour on the other hand. The greater the number of formal lessons was reported to be, the more ideal the attitudes and the less that risky behaviour were reported with regard to rule violations and speeding. High numbers of

lessons taken with a lay instructor were associated with high levels of self-assessment. There were also positive correlations between the number of lay instructor lessons on the one hand, and non-ideal attitudes and risk behaviour on the other hand. Driving experience was positively associated with non-ideal safety attitudes and risk behaviour. Driver training was related to the respondents' evaluation of their driving skills. The results also showed that attitudes as well as self-assessment of driving ability were significantly associated with self-reported risk behaviour. This was especially true for attitudes related to rule violations. There was a strong association between crash involvement and exposure measured as the number of months of holding a licence. Young novice drivers' crash involvement seemed to be more strongly associated with driving skills (manifested as self-assessment of driving ability) than safety attitudes and self-reported driver behaviour.

The conclusion is that formal and informal practical driver training seems to complement each other. Formal as well as informal driver training are important, due to the fact that they are differently associated with output variables important for traffic safety. Professional practical driver training is needed in order to deal with the more demanding elements in the Norwegian syllabus, such as influencing young drivers' safety attitudes and developing their critical assessment of their own driving ability. Lay instruction provides valuable driving experience during extended supervised training.

3.3 Paper III: Differences between formal and informal practical driver training as experienced by the learners themselves.

Paper III focuses on practical driver training before licensing for drivers of passenger cars. The main aim was to examine and compare the amount and content of lay instructor and professional driver training as perceived and reported by the learners themselves. This included how various educational elements were emphasised. It was also examined how these differences contribute to variance in safety relevant variables as self-assessment of driving skills, safety attitudes and risk behaviour. The results showed that the respondents perceived professional instructors to place different emphasis on educational elements compared to lay instructors. An additional aim was to examine the relations between driving skills, safety attitudes and risk behaviour on the one hand and didactical characteristics in formal and informal driver training on the other hand. The results showed that the examined didactic properties of the practical driver training are associated mainly with developing driving skills (measured as self-

assessed skills) rather than safety attitudes and risk behaviour. The study indicates that lay instruction depends on a 'safety margin strategy', resulting in avoidance of the most challenging aspects of training. Regression analyses showed that the educational aspects of greatest importance to self-assessed skills were the learner characteristics and the amount of lay instruction, as well as the lay instructors' emphasis of the educational elements, clarity in communication about risk and formative evaluations as perceived by the learners. The conclusion is that the two forms of instruction should complement each other. In particular, the more demanding aspects of driving must be dealt with through professional driver training while a high amount of informal accompanied driving contributes significantly to development of driving skills measured as self-assessment of driving skills.

4. Discussion

The main aims of the study were to examine differences between formal and informal practical driver training as well as the consequences of these differences. The specific aims were to examine these differences with regard to associations between features of formal and informal driver training on the one hand and safety attitudes, self-assessment of driving ability and risk behaviour on the other hand. The study examined determinants of risk behaviour in traffic which were assumed to be influenced by practical driver training. In order to contribute to assessment of the validity of the determinants as predictors of risk, it was also an aim of the study to examine the association with crash involvement.

An additional aim was to examine the relationship between educational content, emphasis of the content in the instruction as well as associations from other didactical categories on the one hand, and self-assessment, attitudes and behaviour on the other hand. The basis for this examination was an objective to prepare for identification of working mechanisms in practical driver training.

A further aim was to examine differences in educational content and methods in practical driver training in order to provide a base for assessment of the balance between formal and informal practical driver training. The following discussion will focus on the results of the papers in relation to each other, and will discuss methodological problems as well as some basic problems relevant for all the three papers.

4.1 General discussion and implications of the findings

4.1.1 Dimensionality in self-assessment of driving ability

The introduction presented theoretical support for a body dimension within driver behaviour decision-making. The present thesis hypothesised such a body component to be an aspect of self-assessment and that self-assessed driving ability partly comprises perception of a feeling of what is possible to deal with in a specific driving situation. Accordingly, *the present thesis examines self-assessment of driving ability with regard to dimensionality.*

This investigation was carried out in Paper I. The associations between the current self-assessment dimensions and predictors for these dimensions were also examined.

The present study explored a measurement instrument in order to examine the dimensionality in self-assessment of driving ability, which is assessed to be an important criterion variable for measuring the effect of practical driver training. The psychometric quality of the new instrument was satisfactory (Paper I). The existence of multidimensionality in self-assessment of driving ability is regarded as an important finding. In most cases, former research has used only two dimensions: a safety orientation dimension and a skill dimension (see for example Spolander, 1983). The inclusion of a body dimension in such an instrument is a new contribution in traffic behaviour research.

The value of self-assessment of driving ability lies in its importance for regulation of the driving process. If there is a gap between self-assessment and actual ability, there is a risk of inappropriate regulation of the driving process, in turn leading to a higher risk of crash involvement. From an educational point of view, self-assessment of driving skills should be incorporated into driver education in order to improve the accuracy in the skills which learners perceive themselves to have.

It is worth noting that the results showed that professional instruction is negatively correlated to self-assessment of skills, while lay instruction is positively correlated to self-assessment. A possible explanation for the negative self-evaluation amongst those who reported high amounts of formal training may be that the training focused on the problem of overconfidence, in accordance with the learning objectives present in the driver training curriculum (Norwegian Public Roads Administration, 2004). Thus, the results indicate that formal training successfully contributes to fulfilling this objective.

In order to identify predictors of variance in self-assessment, the relations between the dimensions of self-assessment and other important variables such as age, driver experience and sex were examined. In Paper I this is done by using multivariate analyses showing the relations between self-assessment variables and risk, sex and driving experience respectively. In addition regression analyses were conducted showing the relations between self-assessment, age and driving experience. However, the association between driver training and self-assessment is only examined by simple correlation analysis. A relevant observation is that in order to test the influence from driver training further it would be interesting to include form of driver training in the regression analyses. Further analyses would also provide the opportunity to control for and to assess the importance of the other predictors, including age, which unfortunately

was excluded from the multivariate analysis (MANOVA) in Paper I. These supplemental analyses were carried out and are attached in the Appendix to the thesis. Hierarchical regression analyses were also conducted in order to examine further to what extent driver experience moderates the effect of sex (see the Appendix for presentation and discussion of the results).

A further objection to the analyses in Paper I is that it might be difficult to assess the directions of the associations. The scales regarding self-assessment are changed without further comment other than a footnote beneath the MANOVA table. The paper also lacks some correlation analyses giving an overview of the associations which would simplify interpretation of the directions between the variables. Such correlation analyses are therefore provided in the Appendix.

The findings in this study imply that formal practical driver training is more neutral with regard to effect in self-assessed ability compared to informal driver training, which is associated with higher estimated ability. The consequences for the balance between formal and informal driver training is that informal training has to be supplemented with formal training in order to fulfil the educational goal stating that novice drivers should develop a self-critical view of their own driving ability.

The body dimension in self-assessment of driving ability

As shown in the theory section in the Introduction, there is theoretical support for the assumption that bodily anchored feelings are present in driving behaviour decision-making (see for example Gibson and Crooks, 1938; Rumar, 1988; and, Vaa 2004). It is also shown that the presence of such an element may be important with regard to risk (see for example Damasio, 1994; Zajonc, 1980). Thus, it is of current interest to identify such an element among determinants of driving behaviour and risk. The present study's identification of a body dimension within self-assessment of driving ability represents a step towards empirical support for bodily anchored feelings within driving behaviour decision-making. Moreover, this dimension was also shown to be one of the most important contributors to explained variance in crash involvement. The results of the comparison between self-assessment, safety attitudes and risk behaviour with regard to the association with crash involvement are discussed below.

The identified body dimension represents a link to the basic presupposition in this thesis regarding self-assessed driving ability as a result of a feeling of what is possible

and what is not possible to manage in a specific driving situation. This aspect of feeling in driving is interpreted in the present thesis as being in line with the description of the development of driving competence described in Dreyfus and Dreyfus (1986).

Similarly, the suggestion that overstating is due to inappropriate calibration of the driving relies on an assumption that this strong perception of bodily control may represent a trap for an inexperienced driver. The strong association with accident involvement gives support to the view that the body dimension plays an important role in drivers' decision-making. However, further research, also in longitudinal settings, is required to further elucidate the role of the body dimension.

The body dimension in self-assessment and the relations to driving behaviour models

The identification of a new and bodily anchored dimension within the self-assessment construct is interesting. This dimension captures the driver's perception of the car as a prolonged part of his or her body. In the following, driving behaviour models are discussed in the light of the finding of a body dimension in self-assessment.

In the skill model (Dreyfus & Dreyfus, 1986), competence is considered to be bodily based. For the skilled professional the tool will serve as a prolonged part of the body. This integration between the body and the tool is a premise for professional performance within the domain. The body dimension consists of items such as the perception of being in unity with the car, knowing immediately whether the car fits into a narrow passage ahead, knowing the position of the car precisely, and knowing the exact stopping distance needed for maximum braking in a specific situation. It seems reasonable to interpret the body dimension in the present self-assessment instrument as congruent with the view presented in the skill model by Dreyfus and Dreyfus and the view of Merleau-Ponty (2002).

However, the fact that the car is perceived as a prolonged part of the body does not necessarily mean that the identified body dimension is similar to the role of emotions in driving behaviour models, even though feelings and emotions are bodily based.

The body dimension identified here may be relevant for other driving behaviour models that rely on the body as an important actor in the driving process. The research literature gives convincing support for the role of self-assessment as an important base for behavioural choices in driving (e.g. Elvik, Mysen, & Vaa, 1997; Christensen &

Glad, 1996; Glad, 1988; Gregersen, 1996; Keskinen, Hatakka, Katila, & Laapotti, 1992; Hatakka, Keskinen, Gregersen, Glad & Hernetkoski, 2002; Peräaho, Keskinen, & Hatakka, 2003). It follows that dimensions within a valid self-assessment notion must also appear in valid driving behaviour models, i.e. the notion must be theoretically apparent on one level or another within the models explaining the driver's behavioural choices. In addition it must be able to explain variance in crash involvement. Judging whether specific dimensions of self-assessment are consistent with a certain driving behaviour model is partly a theoretical conceptual question. What is needed is to identify the components within the concept of the model, and to determine whether the specific body dimension may be included within the conceptual frame of the model.

The question is how the captured self-assessment notions may be interpreted to fit the approach in various driving behaviour models other than the skill model.

The association with crash involvement underlines the importance of how the driver assesses his or her own driving ability in relation to the perception of hazards. Driving should continually be regulated to balance between the driver's ability, the perceived hazards and the difficulty of the task. Fuller has described the basis for the regulation of driving to be the perception of task difficulty rather than the perception of risk (Fuller, 2005). Driving too fast will increase the task difficulty and may lead to situations where the driver doesn't cope due to skill deficiencies.

In this perspective the finding of a body dimension within self-assessment supports the statement that appropriate self-assessment relates to a feeling of what is possible to cope with in a certain driving situation. The driving must be adapted into harmony with this feeling, which is developed through driving experience as well as through the establishment of appropriate driving habits.

However, perception and recognition of hazards may still be totally different from perceiving the car as a part of the body, even though the perception of risk manifests itself in the body as a kind of uneasiness or gut feeling in accordance with Damasio's "somatic marker" (Damasio, 1994).

There is reason to interpret Dreyfus and Dreyfus' (1986) description of the tool as a prolonged part of the body to imply working processes and behaviour to be automated and intuitively driven. It is a characteristic of high level professional competence that

for example the carpenter's shaping of a log is carried out automatically and intuitively and without a need to move the log to and fro in order to adapt it to the other logs while building a log cabin. Moreover, the carpenter knows exactly what to do and how to do it in order to make the log fit, but it might be impossible to explain this process precisely, adequately and in detail to others in words.

Consequently, there is little doubt that experiencing the tool as a part of the body must include the relation between the tool and the environment as well. In driving this may be understood as similar to the traffic surroundings, which the driver has to understand and adapt to more or less intuitively depending on his or her experience.

However, the question remains as to whether experiencing the car as a prolonged part of the body is a premise for adequate self-assessment in regulation of the driving process. The thesis does not give the answer. However, the question is highly relevant for further research in order to refine models of driver behaviour.

Observing and identifying hazards is context dependent. A hazard is a hazard dependent on how the driver chooses to act according to the information the driver is able to perceive regarding the traffic environment, the speed of the car, physical energy, manoeuvring conditions as well as limitations of the vehicle and within the driver. A moose crossing the road represents little danger provided the speed is low, the grip is good, the brakes are functioning and the driver knows how to use them. Perhaps perception of the car as a prolonged part of the body implies that access to and processing of this information is automated at a subconscious level.

This may occur in such a way that the driver sees the moose without knowing it at a conscious level. Without further reflection he slows down even before he is aware that in fact there is a moose at the side of the road. This type of automated and bodily-dependent response makes the driving process and decision-making more effective, independent of conscious decisions in order to act, even though the situation might be rather complicated.

This is similar to Damasio's "somatic marker" and Vaa's suggestion that we drive using a "gut feeling" as a guide for our behaviour. However, it seems to be independent of Rumar's notion of a switching mechanism as a premise for moving from the automated skill-based level to the conscious level.

In this respect there is a difference between Rumar's position, which sees acting in difficult and complicated, risky situations as dependent on conscious decisions, and Damasio and Vaa, who claim that such a situation does not allow much time for conscious consideration of different alternatives before acting.

The conception of such a switching mechanism as a precondition before acting in complicated situations seems to be poorly adapted to the need for immediate and precise action. Moving from an automated level over to a conscious level involves a delay in acting which may mean acting too late.

The identified body dimension is probably a precondition for acting in harmony with the needs of the situation and is more in accordance with Vaa's model of driving behaviour and Damasio's model of decision-making in contexts involving risk.

Driver behaviour models based on the information processing approach lack this idea of a body marker. Even though self-assessment is important in the GDE model, a body dimension seems to be absent.

In the following I will discuss the relationship with the two most recent driving behaviour models: the model developed by Vaa (2004) and the GDE matrix (Peräaho et al. 2003).

The model of Vaa (2004) and the GDE-matrix (Peräaho, 2003)

Vaa (2004) distinguishes between internal components (the monitor, i.e. the body) and external components. The environment contains the external components, such as the vehicle, the traffic system and road environment, and other road users. The driver monitors external components through continuous information processing. Vaa emphasises the direct tactile contact with the vehicle as a part of this information processing, which gives the driver the immediate perceived balance and perception of the physical G-force influencing him or her (Vaa, 2004). This direct tactile contact with the vehicle points to a unity between the driver and the car, in accordance with the finding of a body dimension in self-assessment.

In Vaa's model, the role of the feeling component within safe driving behaviour is considered a necessary condition in order to make safe decisions in line with the need for immediate and preconscious action (see also Damasio, 1994). The GDE model

presupposes that self-assessment must be developed by making it conscious. This is in contrast to perceiving self-assessment as a feeling of what is possible or not possible to perform in a specific driving situation. While the skill model, as well as the model developed by Vaa (2004), allows for unconscious emotions to be important parameters in decision making, the GDE model does not include this possibility.

Certainly, the GDE model embraces the view that action and decision-making may be automated (Norwegian Public Roads Administration, 2005). However, the role of emotions and feelings in this process is partly overlooked. In Peräaho et al. (2003), the emotions considered are limited to those such as aggression, bad mood and stress and are considered as solely risk-increasing factors. The countermeasure is to make the driver conscious of such tendencies. Consequently, within the framework of the GDE matrix self-evaluation skills are seen not to develop automatically but should be included as a part of the training.

In contrast, Vaa (2004) perceives emotions and feelings as the most effective basis for safe and rapid decisions in situations which require immediate action.

Educational consequences

Following the logic in Vaa (2004), it is a question of developing the unconscious emotions, the gut feeling, and the somatic marker to be calibrated (see also Damasio, 1994; Dreyfus & Dreyfus 1986). The solution is increased training and driving experience. In the GDE model the pedagogical task is to raise the young driver's consciousness regarding self-assessment of driving ability. The solution in the GDE matrix is educational measures to increase awareness regarding personal limitations and tendencies.

In other words, the body dimension is more in line with the model developed by Vaa than with the GDE matrix. The finding of the body dimension's importance in explaining variance in crash involvement supports this view.

4.1.2 Self-assessment of driving ability, safety attitudes and risk behaviour as predictors of risk

One of the aims in the study was to investigate these parameters' relationship to accident involvement (Paper II).

If self-assessment, safety attitudes and risk behaviour are used as substitutes for a risk measure as outcome variables for driver training, the underlying assumption is that these determinants are closely associated with risk. In the present study each of the determinants was entered into negative binomial regression analyses controlled for an exposure measure, and with crash involvement as dependent variable. The analyses showed that all three determinants were highly associated with crash involvement. However, entering all of them together into a separate analysis gives an opportunity to compare the scales. Hence, self-assessment, safety attitudes and risk behaviour were entered into a negative binomial regression analysis controlled for number of months holding a license as an exposure measure, and with crashes as dependent variable.

The Wald chi-square, which is provided in the negative binomial regression analyses, was used to compare the association between the three forms of psychological constructs and crash involvement. However, this was unfortunately not reported in the table in the paper, nor was the standardised Beta reported. Thus, a revised table is included in the Appendix to the thesis.

As expected, the results clearly showed *months with a licence* to be the most important predictor variable. However, the other variables showed interesting results. Self-assessment of driving ability remained significant also with all the other variables entered into the regression analysis, while none of the dimensions of safety attitudes remained significant. The DBQ measure *violation* was the only one of the DBQ dimensions having a significant influence on crashes. Nevertheless, these results support the view that motivation and intentions play a role in drivers' crash involvement. Hence, the pure skill-oriented approach apparent in Dreyfus and Dreyfus (1986), Marek and Sten (1977) and Rasmussen (1982) needs to be complemented with the view expressed in models including motivational and intentional aspects of driving, such as the models described in Gibson and Crooks (1938), Taylor (1964), Näätänen and Summala (1974; 1976), Wilde (1982), Fuller (1984; 1988; 2005), Vaa (2004), Ajzen and Fishbein (1980), Fishbein and Ajzen (1975).

Why did the analyses show this pattern? Why do self-assessment of driving ability seem to be stronger associated with risk compared to safety attitudes and self-reported behaviour? The differences between self-assessment, safety attitudes and risk behaviour as predictors of risk may be a result of differences in the properties of the instruments as well as differences due to substantial differences as predictors. These possibilities are discussed below in the section on instruments.

4.1.3 The association between practical driver training and self-assessment of driving ability, safety attitudes and risk behaviour

Examining the associations between practical driver training and the three designated outcome variables (self-assessment, safety attitudes and self-reported driving behaviour) is an important objective of the present study. As shown in the Introduction, there is theoretical and empirical support for the importance of these factors. The associations between the current self-assessment dimensions and practical driver training as predictors for these dimensions were examined in Paper I.

The results showed that professional instruction is negatively correlated to self-assessment of skills, while lay instruction is positively correlated to self-assessment. A possible explanation for the negative self-evaluation amongst those who reported high amounts of formal training may be that the training focused on the problem of overconfidence, in accordance with the learning objectives present in the driver training curriculum (Norwegian Public Roads Administration, 2004). Thus, the results indicate that formal training successfully contributes to fulfilling this objective.

The results also showed that the better the respondents perceived their driving ability to be, the lower their level of risk proved to be. Consequently, it may seem contradictory to regard as positive the fact that lower self-assessment was associated with formal driver training even though the analyses showed high levels of self-assessment to be associated with lower crash risk. This question should be assessed in light of the “overestimation hypothesis” in which appropriate self-assessment is seen to be of importance for accident involvement. The fact that high levels of self-assessment are associated with low crash risk is probably due to accordance between self-assessed and actual skills.

However, it is still possible to perceive one’s own driving ability to be better than it actually is, resulting in situations the driver is not able to tackle adequately.

Overestimation can be avoided in two ways: first by improved driving skills, second by appropriate self-assessment. Consequently, there is no logical difference between designating driving skills as an important learning objective and specifying appropriate self-assessment as an important learning objective, in line with the driver training curriculum. So far, there has been no discussion about the importance of appropriate self-assessment; this is apparent in the GDE model as well as in the Norwegian driver training curriculum. However, technical skill-oriented driver training as a cause of inappropriate self-assessment is widely accepted as a problem, as indicated in the GDE model, which considers overconfidence to be a possible side effect of skill-oriented driver training. Overestimation may lead to inappropriate regulation of the driving process due to a disparity between actual and self-assessed driving ability.

The results of the present study point to the necessity of focusing on the balance between skills and self-assessment, in part by improving skills.

Important in this context is the fact that drivers with many formal driver training lessons have little lay instruction and limited driving experience, which is also reflected in their skills. It must be regarded as advantageous that drivers with limited driving skills have a more self-critical view of their own driving skills compared to more experienced drivers.

The findings in this study imply that formal practical driver training is more neutral with regard to its effect on self-assessed ability compared to informal driver training, which is associated with higher estimated ability. Consequently, informal training needs to be supplemented with formal training in order to fulfil the educational goal specifying that novice drivers should develop a self-critical view of their own driving ability.

Paper II shows clearly that it is possible to explain much of the variance in crash involvement by means of the dimensions of self-assessment, safety attitudes and risk behaviour. A possible conclusion is that skill training is underemphasised in the driver training curriculum. However, the question is whether practical driver training actually targets these important explanatory factors.

The study showed that informal driver training is associated with non-ideal safety attitudes and risk behaviour, while formal driver training is associated with ideal safety

attitudes and low scores on risky behaviour. The findings are significant at an appropriate level, 1%. Despite the high significance levels, the positive associations between formal practical driver training and safety attitudes are relatively weak; indicating that other kinds of processes than those available in practical driver training are needed to influence safety attitudes. Accordingly, this finding indicates that strengthening safety attitudes should be addressed by other types of formal driver training than solely in-car training.

In order to assess these variables as valid for determining the safety effect of driver training, the thesis investigates the relations between self-assessment, safety attitudes and risk behaviour on the one hand and crash involvement on the other hand. Even though it was neither an aim of the study nor a part of any of the papers, in this context it is of interest to investigate the direct associations between the two forms of practical driving and crash involvement. Such additional analyses were conducted and are discussed in the appendix. The analyses showed weak and not consistent results.

The content and emphasis of educational content as determinants of the score in attitudes, self-assessment and risk behaviour

As described in the Introduction, it is an aim of the thesis to examine the relationship between practical driver training and outcome variables such as safety attitudes, self-assessment of driving ability and self-reported driving behaviour. Driving practice may have other effects on important explanatory factors for crash involvement compared to theoretical lessons.

However, the results showed that splitting influencing factors into content and emphasis of different themes during instruction in practical driver training did not identify determinants strongly linked to self-assessment, safety attitudes or self-reported driving behaviour. Consequently, the extent to which factors other than driving practice alone influence the outcome variables remains undecided.

The results seem to support the view that practice relating to a task or within a domain mainly influences skills. Put simply, young drivers will develop high performance if they practice frequently and often. Lay instruction provides driving experience, seemingly without other effects than those linked to the increased amount of driving experience. This is in line with the prevailing view of skill-oriented accident causation and driving behaviour models, as found in Dreyfus and Dreyfus (1986), Marek and Sten (1977) and Rasmussen (1982). This is also taken into consideration in the GDE-

model by emphasising an early start in driver training and also lay instruction as one way to gain driving experience under circumstances in which safety is taken into consideration by an experienced adult driver.

One possible reason for the rather weak associations between driver training, safety attitudes and risk behaviour may be the fact that this study focused on *practical* driver training, i.e. practice behind the wheel. Behind-the-wheel training probably has an inherent focus on the specific driving task. The outcome of the training may be a result of the need to solve the immediate driving tasks determined by the driving situation. However, it may be argued that over time the focus of the instruction will evolve in line with the learner's development of skills. If so, increased amounts of practical driver training may make it possible to cover important educational aspects, such as safety attitudes and environmentally sound driving, that are not fulfilled by less practical driver training. On the other hand, the association between safety attitudes and lay instruction contradicts this possibility, as the analysis showed a significant negative association between increasing amounts of lay instruction and safety attitudes.

This indicates that training must be directed towards attitudinal goals in order to exert an influence on safety attitudes. However, it is more difficult to direct lay instructors than professional instructors, given that the latter are required to follow the teaching plan and the syllabus.

4.1.4 Differences in content between formal and informal driver training

The present study indicates that lay instructors prioritise elements that are important for safety margins. This may be due to the lack of dual control units as well as commitment to the safety of the learner, who usually is a close relative, such as a son or daughter. However, this 'safety margin strategy' leads to avoidance of many challenging elements in lay instruction. Overtaking, training in acceleration lanes and driving in the dark are examples of aspects given low priority in lay instruction, while these elements are highly prioritised in professional instruction. The differences between lay instruction and professional instruction are great not only with regard to the content; professionals prioritise the different elements in instruction higher overall compared to lay instructors. This may support the finding by Groeger and Brady (2004) that professionals give more instruction compared to lay instructors. These differences are probably a result of inherent differences in competence, attention and a necessary focus on safety in the situation. Their lack of instruction routine may make it more

challenging for lay instructors compared to professionals to focus on learning objectives other than those directly related to an ongoing driving situation. In addition, it is not expected that lay instructors will have sufficiently detailed knowledge of the official learning objectives determined in the national curriculum.

The conclusion is that the two forms of instruction should complement each other. In particular, the more demanding aspects of driving must be dealt with in professional driver training, while a substantial amount of informal accompanied driving contributes significantly to the development of self-reported driving skills.

4.1.5 The association between the didactic characteristics of the training and the outcome variables

The examined didactic variables related to the practical driver training (Paper III), both professional and lay instruction, were associated mainly with the development of self-assessment of driving skills rather than safety attitudes.

The didactic properties of greatest importance for self-assessed driving skills were learner characteristics and the amount of lay instruction, as well as the lay instructors' emphasis of the educational elements, the clarity of communication and the instructors' formative evaluation and feedback, including the learner's perception of the assessment. This is also in accordance with findings from Hattie (2009).

Further, variables such as gender and driving experience are strongly associated with driving skills, measured as self-assessment of skills in performing specific driving tasks. However, much remains unknown about the origin of the associations between practical driver training and the outcome variables, in particular safety attitudes and self-reported driving behaviour. It may be the driving situations themselves, it may be a result of the experience learners have gained, or it may result from features related to the instruction or lack of instruction. It is necessary to find out more about how instruction is associated with the outcome, and variables other than those examined in the present study may be of importance.

4.2 Methodological considerations

4.2.1 Recruitment to formal and informal practical driver training

There may be individual differences between students with substantial amounts of accompanied driver training with a lay instructor and few professional lessons and those who have the opposite distribution between lay and professional training. Paper I suggests that geographical conditions may influence the possibility for lay accompanied driver training.

This question is further discussed in Papers II and III. The discussion in Paper III refers to two regression analyses with the amount of lay instruction and professional driver training as dependent variables, while level of urbanisation, sex, school grades, and traffic experience were entered as predictors. These analyses are provided in the appendix of the thesis. The conclusion is that there are individual differences behind variances in the amounts of the two types of practical driver training. However, they are minor and could not have been controlled for.

4.2.2 Accidents and risk as criterion variables

In research which aims to examine the safety impact of driver education, it is preferable to use accident involvement as a criterion variable. However, it has usually been very difficult to establish a significant relationship between driver training measures and crash involvement. One explanation for the difficulty in showing such connections has been that the variables are at different levels of specificity (Iversen, 2004; Stene, 2005; Ulleberg, 2002). Ajzen stressed in his TPB that measured attitudes and measured behaviour should be at same level of specificity in order to identify close associations in an attitude-behaviour relationship. Drawing on Ajzen in this context, however, presupposes that it is possible to regard accidents as a kind of behaviour. Yet regarding accidents as behaviour in a TPB-model violates important premises in the TPB, in which intentions are seen as important determinants of behaviour. The intentions of accident victims were probably to avoid an accident. Accidents are the unintended result of behaviour, and often a result of risky behaviour, albeit sometimes a result of behaviour that is not identifiable as risky.

In educational interventions samples will often be relatively small due to the costs involved. Further, in longitudinal studies the fact that accidents rarely occur is a complicating factor. The combination of accidents as rare incidents and small sample

sizes will yield low statistical power. To deal with this, the present study is based on a survey, making it possible to have a bigger sample of respondents. In addition, a relatively wide definition is employed by using all accidents, including accidents with only material damage as well as serious accidents. The benefit of this approach is that accidents can be used as a criterion variable and it is possible to gain significant results. The disadvantage, however, is that there may be differences between minor, less serious accidents and more serious accidents with regard to impact mechanisms, and these differences remain undetected. In addition, self-assessment of driving ability, safety attitudes and self-reported behaviour is used as a relevant substitute for the association with risk.

Complicated impact mechanisms in a chain with many connections

There are also other problems associated with using crash involvement as a criterion variable for the effect of driver training.

There is no linear association between risk factors and negative outcomes like crashes. Even very risky behaviour will seldom result in a crash. The usual outcome is that everything goes well and no crash occurs despite risky actions on the road. In addition: a large number of risk factors other than risky behaviour also pertain, which means that crashes sometimes occur even though the behaviour may have been seemingly adequate. In other words: crashes are the result of a complicated course of events, with a large number of risk factors influencing the outcome.

Crashes are rare events. Consequently, the time elapsed between teaching and training and the occurrence of an accident may be very long. Furthermore, road user behaviour is determined by many other factors in addition to the training completed before licensing. When analysing specific accidents, it becomes apparent that there are numerous risk factors that influence the course of events leading to a crash. When performing an in-depth analysis, it may seem meaningless to ask how the driver training should have been designed in order to prevent a specific accident. This simple question almost inevitably highlights the difficulties involved in influencing individual behaviour during pre-license training, which is often a short-term activity that took place many years prior to the accident.

It should be borne in mind that using driver training as a road safety measure relies on an assumption that the “effect” will survive through all the links from the training to the

crash. The training is presumed to influence attitudes, motivation, intentions, and perceived behavioural control (see for example Ajzen, 1980), as well as technical skills and safety skills, in turn influencing driving behaviour in a manner that will prevent accidents. Each link in such a chain of events vastly increases the number of possible outcomes.

The distance between the measure and the negative outcome (in the form of an accident) may simply be too great, in time as well as in the number of links between the measure and the outcome. Of course, the effect might be present but have been so diluted that it is no longer possible to detect, at least not in terms of reduced crashes.

Ajzen's suggestion that measured attitudes and measured behaviour should be at same level of specificity in order to identify close associations in an attitude-behaviour relationship may have relevance for the connection between measures and accidents as well. Even more important is the observation that efforts within road safety should utilise safety measures addressing the safety problems as directly as possible, rather than through measures sensitive to dilution. Strictly speaking: If speeding is the safety problem, a speed limitation device is far more effective than an educational measure intended to induce the driver to drive in accordance with the speed limits, simply because the speed limitation device addresses and targets the speed directly.

4.2.3 Accidents and causation

The present study is a cross-sectional survey study. Thus, the study does not allow for conclusions regarding causality. The results are based on regression analyses and MANOVA, as well as LISREL and principal component analyses. By means of the statistical approaches applied in this study it is still possible to examine associations between essential variables and also to examine to what extent assumed determinants explain variance in important outcome variables.

The idea behind accident prevention is based on the fact that we prefer to think of accidents as a result of causal processes. However, it is important to note that accidents are partly a result of randomness. There is no reason to explain variance in accidents if the variance is mainly a result of randomness. In the present thesis the degree of randomness in the accident data is calculated in Paper II, providing a good basis for testing associations between different explanation models such as safety attitudes, self-assessment of driving ability, and self-reported driving behaviour on the one hand and

crash involvement on the other hand. However, due to the large number of possible outcomes of a given behaviour, it will never be possible to predict an accident at the individual level.

4.2.4 Levels of explanation and perception of risk

The conclusion reached is that accidents are not purely random, i.e. there are causes behind the occurrence of road traffic accidents. However, this gives rise to the following questions: Is identification of such causal entities an adequate guide for individual driving behaviour? Are accidents mainly a result of individual miscalculations or are they a result of the traffic system as a whole? *At what level do we identify safety gain and safety problems in daily driving?* Considering driver training as a road safety measure presupposes that safety problems are apparent at an individual level and that it is realistic to prevent accidents by motivating individuals to drive more safely.

Are learner drivers an appropriate target group for addressing the problems observed in road safety? In principle, the idea that individual road users should act in a way that prevents accidents presupposes that safety differences in specific forms of driving behaviour can be identified and perceived at the individual level. This is not usually the case. For example, we know that lowered speed limits give increased safety in statistical terms, yet where does this safety effect come from? Mainly it is a result of overall improved safety margins that are difficult to observe in other than statistical terms. Many drivers find it difficult to understand this effect in relation to their own individual experience as car drivers. As drivers we are generally confident with the perceived safety we experience when we drive. Drivers usually have positive rather than negative feedback of their unsafe behaviour: as a rule, things go well. This may give rise to the (mostly true) impression that they have full control when driving in traffic. They are aware of risks, and they believe they can avoid most of them (Rumar, 1988). As drivers, we gain experience from driving at different speed levels without negative consequences. Accordingly, it is difficult to use individual needs for safety as an argument for each driver to reduce his or her driving speed. Increased safety is regarded as something occurring someplace in the system, which the individual driver does not experience as relating to him or her.

Using statistical risk as an argument for behaviour at an individual level represents an ecological fallacy in the pedagogical communication of risk as a determinant of driving

behaviour at the individual level. Statistical risk is a statistical construction far removed from the risk that individual drivers experience and perceive in their driving behaviour. Thus, the learning effect of driving is that risk is not present in one's daily driving and is therefore a less important factor to consider when driving. This experience base, which every driver develops, leads drivers to the conclusion that their driving is safe enough. This is one of the most important obstacles to improved safety attitudes and may also be part of the reason why driving experience as well as extensive accompanied driving seems to lead to weakened safety attitudes. What kind of reasoning leads drivers to believe that their safety depends on following the rules when in fact they violate many of them during their daily driving without experiencing dangerous situations or accidents?

Every driver has an attitudinal base which presumes that he or she will be alive tomorrow. Thus, only evidently extreme and dangerous driver behaviour is likely to be prevented by using individual risk as a frame of reference. However, in order to achieve safety effects not visible at the individual level, a more meaningful learning objective may be to cultivate understanding of the fact that every single driver has to contribute to improved safety margins although we will never be able to identify the driver who survived owing to the overall improved safety margins. Finally, this is a question of practising a common sense of responsibility. Individual contributions from every driver are necessary to gain cumulative (statistical) safety effects.

4.2.5 Instruments

Psychometric measurement instruments examine notions that cannot be measured directly, such as personality dimensions. They are also used for measuring attitudes and behaviour. However, a new problem arises. Attitudes as well as behaviour exist not only within the individual, but are also a result of the situational context. As this includes interpretation of the situation, the measurement will to some extent cover a wide range of situational features. There are per se subjective elements in the perception of the indicators related to the concepts. Moreover, the driving context, which is an essential input with regard to assessment of risk in certain forms of behaviour, is determined by the situation. Thus, exaggerated efforts aimed at making the instrument 'objective' by choosing indicators which are neutral and possible to describe in context-free terms may have disadvantages. If an instrument is to be valid as a risk predictor, it is probably important to create items which to some extent make it

possible for the respondents to include some of the subjective context behind the choice of driving behaviour.

Comparison of instruments

The results in the comparison between self-assessment, safety attitudes and self-reported driving behaviour as predictors of risk give reason to discuss the question of how we define and measure attitudes and behaviour. Risky behaviour is not risky per se independent of the context. Exceeding the speed limitation is violation behaviour. However, the risk value of this behaviour depends on the traffic and driving context.

Of course, it is important to note that some of the respondents claimed that they did violate traffic rules, such as for example exceeding speed limits. However, even more important is the context in which such violations occur. Under dry driving conditions, if the violation is only modest, if there is low traffic density, if it is daylight, if the road is good, and if the road surroundings are without dangerous obstacles, then the risk may be rather low. The experienced driver is better qualified to assess the risk value of given behaviour in a given context compared to the inexperienced driver. However, a psychometric measurement instrument can hardly capture variance in the context important for the risk value of the behaviour. The measurement instrument standardises the behaviour independent of the risk value of the actual behaviour, which is obviously context dependent. This is a consequence of describing specific behaviour in objective and neutral terms. However, the key to the risk value, independent of the context of the behaviour, is known only by the respondents themselves. They know under which circumstances they violate the rules. Their behaviour may not necessarily be dangerous in itself, but will become dangerous in combination with other risk factors present within the driving context. The point is that the risk value of a specific form of behaviour is a relative entity. The association with crash involvement is assumed to be a result of the situationally determined risk value of the behaviour.

One difference between the self-assessment instrument and the other instruments used in this study may be that the self-assessment instrument makes it possible to capture more of the context in which the indicators are reported. An important difference between the measurement instruments is in their differing approach to self-reporting. The self-assessment questionnaire contained statements on how driving may be dealt with and perceived with regard to the respondents' skills, traits and experiences connected to imaginary situations. The subjects were instructed as follows: 'The next

part of the questionnaire contains statements about how driving a car may be dealt with and perceived. How well do the statements fit how you deal with and perceive driving a car?' A five-point evaluation scale, ranging from 'Fits me perfectly' to 'Doesn't fit me at all', was used.

In the attitudes instrument as well as in the self-reported behaviour instrument the focus is on objective descriptions of what the respondents think and what they do in neutral and context-free terms when driving. The difference between the respondents' beliefs and behaviour and their perceptions of themselves in a specific traffic situation may make it possible for the respondents to include more of the context behind driving in traffic in the self-assessment instrument.

The analyses have consequences for driver training content. It seems to be more important to emphasise self-assessment skills for identifying risk (in this thesis called safety orientation) rather than influencing attitudes towards rule violations. The ability to take into account risk in traffic is more safety relevant than using attitudes towards rule violations as a criterion for safety skills. Safety margins may be a key in this respect. The finding that the safety orientation dimension within the self-assessment instrument is more strongly associated with risk than safety attitudes may indicate that the ability to assess safety margins is a better determinant of risk than safety attitudes referring to rule violations.

According to Dreyfus and Dreyfus (1986), rules function as context-free advice for action in the early stage of development in driving competence. As such advice does not relate to the driving context, the rules are very restrictive. These rules will gradually be adapted to the demands of the driving situation as the driver's competence and experience improve. Subsequently, the driver's dependence on the rules will be reduced, precisely in accordance with the finding that rule oriented safety attitudes develop in a less than ideal direction with driving experience.

The ability to detect risk develops within the context of traffic and environmental features connected to the situation, while beliefs regarding safety attitudes, such as for example attitudes towards rule violations of speed limits, are context-free as measured by the measurement instruments applied for measuring attitudes in the present thesis.

In everyday human life, with experience, apparent dangers will cease to be as dangerous as they were first thought to be. This will change our attention towards the risk. Drivers will usually gradually reach the conclusion that accidents do not happen to them. Accordingly, they develop a strong feeling of control over situations, which influences their behaviour in directions other than being careful and following the rules while driving. Viewed in this light, it is easy to understand that attitudes towards rules will become more refined and relaxed with increased driving experience.

Although attitudes have been proved to be of importance for road safety, they will develop in a less than ideal direction parallel to acquired driving experience. It may be that attitudes function somewhat like a crutch in the absence of experience-based skills and an ability to assess the dangers and risks connected to specific situations. Such skills may enable a driver to ignore some of the rules that are not important in the immediate driving context.

The difference between safety orientation and safety attitudes

Safety orientation is one of four dimensions within the self-assessment construct, while the category safety attitudes towards rule violations is the most important dimension in the safety attitudes instrument developed by Rundmo and Iversen. At first sight the two constructs seems to be quite similar. However, they function differently as predictors of risk and with regard to the development of attitudes and safety orientation with increasing driving experience. Consequently, there is reason to examine the difference between them.

Firstly, of course, there is an important difference between safety orientation regarded as a skill and safety attitudes which reflect the respondents' agreement or disagreement with statements reflecting evaluations towards conditions, circumstances, situations, decisions, and behaviour relating to traffic safety.

There are also differences with regard to the frames of reference for reporting the two constructs. Safety orientation within self-assessment is linked to items such as the extent to which dangerous situations may occur abruptly, having a driving style that avoids dangerous situations, how competent a driver feels to drive safely, the ability to recognise dangerous situations, and confidence in feeling able to cope with unexpected situations (for further details see Paper I). Safety attitudes use rules and traffic regulations as a frame of reference. This is a more context-free starting point for the

measurement of attitudes, while safety orientation assessments are related to the driving context.

4.2.6 The use of self-reports

In general

The present thesis is based on self-report survey data. The use of self-report questionnaires is one of many methods for collecting data. Self-reports have methodological benefits as well as weaknesses. Self-reports may give access to data which are known only by the respondents themselves.

Large samples are needed to explain and predict behaviour, and self-report survey studies are an alternative method used to acquire data in a cost-effective way. The use of self-completion questionnaires is a method which is well suited to the study of behaviour that is difficult to observe reliably in a short observation period. Attitudes and motivation may also be investigated by self-reports. Self-assessment of driving ability necessarily relies on self-reports, either in the form of interview or by questionnaire. The use of self-report questionnaires makes it possible to obtain aggregated measures of psychological constructs such as, for example, possible determinants of crash involvement. The present thesis makes use of such measures regarding safety attitudes and risk behaviour as well as for self-assessment of driving ability.

Such a method also allows access to information about crash involvement beyond the scope of police and insurance reports. Self-reports may also provide data (although retrospectively) for a longer time span than what is available through observations. One benefit of using questionnaires is that they make it possible to keep the described situation anonymous compared to a face-to-face interview. The respondents' perception of anonymity may be important in order to avoid self-presentation bias.

One well-known problem relates to the vulnerability of how we perceive ourselves (self-serving biases, self-deception) as well as to how we want others to see us (self-presentational biases, impression management). The former is a problem with regard to self-assessment, for example of driving skills, while the latter is a problem when we wish to measure attitudes and behaviour, as well as accident involvement, i.e. information which may be regarded as personally sensitive. Accordingly, the conceptions of self-presentation and self-serving may to some extent overlap one

another. In the present study such mechanisms may be a problem with regard to behaviour, safety attitudes, accidents, and self-assessments, particularly due to the somewhat sensitive information that is asked for.

The influence of giving socially desirable responses in the DBQ (Reason et al., 1990) has been examined in a number of studies (Lajunen, Corry, Summala & Hartley, 1997; Lajunen et al., 1998; Lajunen & Summala 2003). The results indicate that this influence is relatively small in DBQ responses. Similarly, Hatakka et al. (1997) concluded that self-reported driving habits are valid predictors of violations and accidents.

An alternative method of measuring driving behaviour may be observation studies, either in real traffic environments or in simulators. However, observations may influence the behaviour, and the problem relating to biased measurement remains unsolved. Hatakka et al., (1997) pointed to the lack of evidence that social desirability should have a stronger influence on self-report measures than on actual behaviour.

Some of the weaknesses of self-reports can be dealt with by designing questionnaires in ways that take the problems into account. In the questionnaire used in the present thesis, already validated measurement instruments (attitudes and behaviours) were used, in addition to a new measurement instrument in which the problem of social desirability response is taken into account.

Self-assessment of driving ability

The measurement of self-assessment of driving ability has been given particular attention in the present study. Self-assessment of driving ability is often seen as a comparative term (Karlaftis et al., 2003). This raises the question of the comparison standard. Frames of reference have been used in the form of comparisons with an average driver, a novice driver, and an expert driver. However, self-serving biases are well-known when people compare themselves to others.

The concept of 'the average driver' is in itself a pejorative term. It is well known that people in general see themselves as better and more skilled than average within many domains, not just with regard to driving. Furthermore, the ambiguity related to such comparison standards leads drivers to make more positive judgments of themselves simply because of the ambiguity in many standards, regardless of whether it is an average, novice or expert driver that forms the basis for comparison (Dunning,

Meyerowitz & Holzberg, 1989; Groeger, 2000; Groeger & Grande, 1996). Dunning et al. (1989) concluded that people provide self-serving assessments to the extent that the trait is ambiguous, i.e. to the extent that it can describe a wide variety of behaviours, and that such a self-serving pattern disappears once the criteria for judgement are clearly established.

In the present study efforts have been made to design items for self-assessment of skills that are as specific as possible. It has been an aim that the respondent should immediately understand the items and immediately know or feel how to apply them to themselves. To reduce ambiguity, it may be argued that a measurement instrument of self-assessed driving ability should have a high level of specificity. This is in line with Dunning et al. (1989), and also with findings from self-efficacy research indicating that the more specific the description of the task, the more predictive value the measured self-efficacy has with regard to actual performance (Pajares, 1996). This is also in accordance with the theory of planned behaviour (Ajzen & Fishbein, 1980), which claims that the predictor and the effect variables should have the same level of specificity in order for the prediction to be successful. Accordingly, when developing the new measurement instrument there was emphasis on exploring new items with a high level of specificity.

However, bear in mind that asking participants to assess their driving skills and report their crash involvement in the same questionnaire calls for careful interpretations regarding causal relations. For example, if a driver had experienced a crash, this may very well influence his perception of his driving skills. In addition, people have a tendency to give coherent answers. It is probably difficult for a driver to report that he believes he is a very skilled driver after reporting the occurrence of one (or more) crashes (de Craen, 2010). It is possible that measuring self-assessment first and accidents later on would give the opposite direction of the relations between the variables. Still, this will depend on how the driver explains his accident involvement. In the present study, all sorts of mishaps are included, also accidents that are without culpability. This will reduce the risk that reported accident involvement will influence the reported self-assessment of skills. In other words, in the present study it is fully consistent to report accident involvement and still report good driving skills.

Self-reports and crash involvement

Crash involvement represents sensitive information, and self-report of such incidents may easily lead to self-serving and self-presentation biases. Forgetting and lapse of memory may serve as convenient and often unconscious ways of dealing with bad experiences. In order to reduce the sensitivity of crash data as far as possible, the questionnaire in the present study asked respondents to include all crash involvement regardless of culpability or responsibility for the actual crash. There are also other reasons for taking such an approach. Culpability is a very difficult notion. For example, in the event of an accident during the practical (driving) license test in Norway, a consequence of intervention by the examiner is that the candidate does not pass the test. Such intervention may, of course, occur regardless of culpability. If it is possible to avoid a crash, the candidate is required to take action to this effect, even if other road users cause the situation by some kind of error on their part. The reasoning is that it is the safety margins in the driving that are important, rather than the question of culpability. Accordingly, any kind of crash involvement will reflect safety margins to some degree, and represents valuable information in research as well as in driving tests.

Self-reports and education

In the present study respondents were asked to answer questions about their training from memory. Self-reports of educational processes may therefore be biased due to forgetting and lapses of memory. Consequently, it may be claimed that measured differences may result from differences in respondents' memories of events as well as from differences in the actual events themselves. However, when it comes to education and learning processes we need to bear in mind that the target for the instruction is the learners. This important point is highlighted in an EU report (CIECA, 2002):

It is not the message which is delivered, but the message which is received by the participant(s) that counts. (CIECA, 2002: 3)

Consequently, the key to measurement of the outcome of learning processes is the learners themselves. Observation of the teacher in the teaching situation will give information regarding what the teacher actually does, and pre- and post-observation of the learner may also give information regarding development of skills. However, to capture what the learners have perceived in the learning process we have to ask the learners themselves. Also, in order to examine the association between the teaching and psychological constructs such as safety attitudes and self-assessment, and to capture

what the learner is thinking, we have to rely on the learners themselves as information sources. In this respect, self-reports either by interview or questionnaire are the only possible options.

Another question is how self-reports of educational content are made. One consideration is that self-reports reflect what the learners have perceived, which again may reflect their learning pre-conditions. Within education and training, this is a very important issue to take into consideration. There is nothing to be gained by trying to teach someone something that the person concerned is unable to capture. Other ways to check what takes place in learning situations may be observations, interviewing the teacher, or interviewing the learners. However, in the end it is how the learners themselves perceive and utilise the learning situations that counts. Hence, what the learners themselves report to have happened is an essential data source in order to measure the basis for learning outcome.

However, some problems do remain. How can we be sure that the self-reported content results from the training situation and is not influenced by other factors affecting the learning outcome, such as any currently debated issues? For instance, it is apparent that environmental driving is given low priority. This may be due to the learning situation, which may steer the focus towards the development of skill-oriented competence (which to some extent may also be valid in other contexts). Another possibility is that the focus on environmental driving may vary over time and hence will have varying degrees of influence on learners' awareness of environmental driving. This, in turn, may be reflected in self-reports and thereby render self-reports biased. However, there are always many factors other than teaching which influence the learning outcome and, regardless of how the data are reported, it will be impossible to separate such factors from the teaching factor unless experimental designs are applied.

The body dimension and crash involvement

The identification of a bodily component in self-assessment of driving ability is one of the contributions from the present study. It is interesting to note that this body dimension is one of the two dimensions from the self-assessment model that significantly contributes to explained variance in crash involvement. In the regression analysis showing the three models self-assessment, safety attitudes and self-reported behaviour, the body dimension appeared as one of the factors with the strongest association with crashes. This gives support to the assumption that regulation of the

driving process is due to the perceived feeling of what is possible and what is not when facing challenges in traffic and the road environment.

Some driving behaviour models presuppose that the decision-making level is restricted to conscious cognition, as in Wilde's model (1982), which suggests a process founded solely on a rational cost-benefit evaluation of various action alternatives when driving. In line with this basic assumption, self-assessment of driving ability may be seen as a conscious process behind regulation of the driving process. However, theory calls for bodily-situated competence as an important variable in this decision-making (Damasio, 1994; Fuller, 1988; Gibson & Crooks, 1938; Näätänen & Summala, 1974; 1976; Rumar, 1988; Summala, 1988; Vaa, 2004). In the present thesis this emphasis on feeling as a determinant in driving behaviour leads to the assumption that the regulation of the driving process must be based on inclusion of a feeling on the part of the driver of what is possible or not possible in a specific driving situation. This must be linked to self-assessment of driving ability. An important part of this self-assessment conception is a body dimension. The results supported this view.

4.2.7 Controlling for driving experience and other exposure measures

When testing associations between driver training variables and crash involvement, the problem may arise that findings are explained by confounding factors such as exposure. In Paper I a calculated risk measure was applied in order to test associations with risk in a way that make it possible to control appropriately for the effect of exposure. This measure was based on previous crash involvement and driving experience. The rationale behind it is clear: accidents during an activity will largely be a result of exposure to the activity in question. This exposure has to be controlled for in order to identify other predictors behind accident involvement. In terms of driving, the exposure is driving experience, i.e. time spent behind the wheel. As can be seen in Table 4 of Paper I, driving experience was mistakenly applied in the same analysis as the risk measure. However, in the other papers the analyses have eliminated this problem.

In the applied risk measure, the number of crashes was chosen as the numerator and driving experience as the denominator. However, such a risk measure is not without problems. One problem may be that the association with experience will be overestimated compared to the relation with crashes when analysing associations with predictors of risk. The consequence may be that the association with driving experience

is what is actually measured, while the purpose was to examine the association with risk in a way that allowed for appropriate control for exposure.

It should be noted that in this study driving experience was estimated at the individual level, based on a model in which it is assumed that the number of kilometres driven in the preceding months represents an average of the distance driven during the entire period. Accordingly, this entity was used with care in the analyses. In the present study, the results were controlled for both driving experience and months with a licence. The length of time a driver has been licensed is defined precisely, based on the official driver licence registry AUTOSYS.

However, there is little doubt that much driving competence develops through driving experience. Controlling for driving exposure may lead to underestimating important competences in the models, competences where driving experience is an important source of learning in addition to training assisted by an instructor, whether professional or lay.

Despite the fact that the calculated risk measure controls for driving experience by dividing the number of accidents by kilometres driven, using the accident rate as the dependent variable is still problematic. Accidents are very rare incidents. Accident rates among novice drivers are strongly non-linear: that is, the more they drive per year, the lower the accident rate per kilometre driven. Hence, by using a rate, we will not adequately control for differences in exposure to risk. This may result in overestimation of the effect of exposure. Moreover, the distribution does not fulfil the statistical premises for linear regression. Using logistic regression may solve this problem when using crashes as the dependent variable and driving experience as a covariate. However, the disadvantage of this approach is that the accident count would be truncated in order to produce a dichotomous dependent variable. In order to retain the variance in number of crashes and take into account the non-normal distribution of accidents, negative binomial regression was applied in Paper II. This method makes it possible to examine the relation between crash involvement and its predictors by using accidents as the dependent variable directly, and control for exposure by use of some type of exposure measure as a covariate. An additional benefit of this procedure is that problems due to overestimating the effect of driving experience may be avoided. Nevertheless, given that this study is a cross-sectional study, it is not possible to reach a conclusion with regard to direction of the influence between the variables. Theoretically, self-

assessment may influence crash involvement, and it is also possible that crash involvement influences self-assessment. Further research in longitudinal settings may contribute to more accurate knowledge about the causal relations.

4.3 Conclusions

The present study has explored a measurement instrument used to examine the dimensionality in self-assessment of driving ability, which is assessed to be an important criterion variable for the effect of practical driver training. The finding of multidimensionality in self-assessment of driving ability is regarded as important. Most former research has used only two dimensions: a safety orientation dimension and a skill dimension (see for example Spolander, 1983). The inclusion of a body dimension in such an instrument is a new contribution in traffic behaviour research.

The thesis has demonstrated the association between self-assessment of driving ability, safety attitudes and self-reported driving behaviour as outcome variables and practical driver training. These outcome variables were also examined as predictors of risk. The results showed that self-assessment is more important as an explanation variable with regard to accident risk.

Formal and informal practical driver training were examined with regard to content, emphasis in teaching and influence on the outcome variables, and it has been shown that professional practical driver training has different content compared to lay instruction. This indicates that the two kinds of training should supplement each other. Professional practical driver training is needed in order to deal with the more demanding elements in the Norwegian syllabus such as influencing young drivers' safety attitudes and to develop their self-critical view of their own driving ability. Lay instruction provides valuable driving experience during volume training.

5. References

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Paper I

Associations between self-assessment of driving ability, driver training and crash involvement among young drivers

Torbjørn Tronsmoen

Department of Psychology
Norwegian University of Science and Technology,
N-7491 Trondheim, Norway

Norwegian Public Roads Administration
Eastern Region, P.O. Box 1010 Skurva,
N-2605 Lillehammer, Norway

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Torbjørn Tronsmoen

*Department of Psychology, Norwegian University of Science and Technology,
N-7491 Trondheim, Norway*

*Norwegian Public Roads Administration, Eastern Region,
P.O. Box 1010 Skurva, N-2605 Lillehammer, Norway*

Abstract

The core aim of the present study is to examine the psychometric qualities of a measurement instrument for self-assessment of driving ability. The results are based on a self-completion questionnaire survey conducted among a representative sample of Norwegian drivers who were 18, 19 and 20 years of age ($n = 1419$). The response rate was 37%. The results showed that self-assessment of driving ability consisted of the following four dimensions: general driving ability, safety orientation, the body dimension, and specific task skills. The reliability and validity of the measurement instrument were found to be satisfactory. The highest level of self-assessed driving ability was found among male respondents, experienced drivers, drivers who had had a high amount of informal driver training, and drivers with the lowest levels of accident risk. The consequences of the results for driver training and accident prevention are discussed.

Keywords: Road traffic safety; Self-assessment; Driving ability; Young drivers; Driver education; Body dimension

1. Introduction

Young drivers are over-represented in crash and fatality statistics. Within member countries of the Organisation for Economic Co-operation and Development (OECD, 2006) typically between 18% and 30% of killed drivers were between 15 and 24 years of age, although the same age group represented only between 9% and 13% of the total population in their respective countries.

One reason for young drivers' relatively high accident record may be that they tend to overestimate their own driving skills and underestimate the hazards involved in driving (Elvik, Mysen, & Vaa, 1997). It is a general finding that drivers tend to assess themselves as being more skilled than the average driver. This is the case not only among young drivers but also among drivers in general in many countries, and it may indicate that drivers overestimate their driving skills (Delhomme, 1991; Goszczynska & Roslan, 1989; McCormick, Walkey, & Green, 1986; Svenson, 1981). Furthermore, several studies have shown that drivers who have taken skid courses have an increased risk of being involved in an accident (Christensen & Glad, 1996; Glad, 1988). These results have led to the suggestion that such courses could result in drivers exaggerating confidence in their ability to cope with driving on slippery roads without sufficient improvement of actual skills. Consequently, overestimation of driving skills could be a causal factor in such accidents occurring under such conditions. Studies examining the association between skid courses and self-assessment have also supported this hypothesis (Gregersen, 1996; Keskinen, Hatakka, Katila, & Laapotti, 1992).

The importance of unrealistic self-assessment of driving ability as a possible risk factor for crash involvement and, as a possible side effect of driver education, this is taken into consideration in the 'Goals for Driver Education' framework, the GDE-model. The model describes driving ability in a hierarchy of four levels comprising vehicle manoeuvring, mastering traffic situations, goals and context of driving, and goals for life and skills for living at the top of the hierarchy (Hatakka, Keskinen, Gregersen, Glad, & Hernetkoski, 2002; Peräaho, Keskinen, & Hatakka, 2003). Development of self-evaluation skills as an educational aim is present in all four levels in the model. Consequently, self-assessment of driving ability is of current interest as an outcome variable with regard to the effects of driver training.

To a large extent, driving is a self-paced task (Näätänen & Summala, 1974; Taylor, 1964). The driver can influence the demands of the driving through behavioural

choices. Ideally, the demands should match the driving ability of the driver. This is a function of regulation within the continuous driving process. Self-assessment is supposed to play a role in this regulation process (Spolander, 1983). When demands and abilities correspond the driving behaviour is considered as calibrated (Milech, Glencross, & Hartley, 1989). The calibration of the driving relates to vehicle manoeuvring and mastering traffic situations, the two lowest levels of the GDE-hierarchy. It is important to identify dimensions of self-assessment related to these two levels.

1.1 The concept of self-assessment of driving ability

Previous research has aimed at clarifying the conception of self-assessment of driving ability. Svenson (1981) used the two dimensions skills and safety, while Spolander (1983) identified similar dimensions, namely defensive driving skills and technical driving skills. Also driving performance and driving behaviour have been used as a similar dichotomy (Evans, 1991). Karlaftis, Kotzampassakis, and Kanellaidis (2003) recognized the two latent dimensions speeding and safety. Lajunen and Summala (1995) used a two-factor view, comprising skilled and fluent driving (the skill-factor) and a second factor related to safe and anticipatory driving (the safety-motive factor) as their point of departure in a study measuring the relation between driving experience, personality and self-assessment dimensions. Elander, West, and French (1993) used the terms driving skills and driving style. In some studies driving style has been labelled safety orientation, for example by Lajunen, Corry, Summala, and Hartley (1998). Groeger and Brown (1989) found that self-assessment consists of seven dimensions: dissociation, smoothness, caution, defensiveness, recklessness, impulsiveness, and anticipation. All of the aforementioned studies seem to agree that self-assessed driving ability is multidimensional. One objective of the present study is to examine the dimensional structure of such self-assessments. Within the GDE-model the skill dimensions seem to belong to the two lowest levels of the hierarchy, i.e. *vehicle manoeuvring* and *mastering traffic situations*, while the safety-orientation dimensions should be ranked in the upper levels, *goals and context of driving* and *goals for life and skills for living*.

In the present paper self-assessment of driving ability is suggested as being present as a feeling of what is possible to do and what is not possible in a continuous driving process. This follows as a result of the regulation of the driving process described in the two lowest levels in the GDE-model. In a demanding driving situation adaptation to the

situation and choice of behaviour will result from both immediate and continuous perception of balance between the feeling of risk and the feeling of ability. In turn, this continuous balancing in the driving process partly will be a result of conscious assessments and partly it may reflect an automated process situated within the body. Hence, it is of interest to measure the strength of perception of the tool or remedy (in this case, the car) as a part of the body, which is a characteristic of high performance skills in many crafts. Merleau-Ponty (2002) suggests the car may be conceived as a prolongation of the driver's body. A driver may experience the car as a part of the body that is similarly controlled and perceived as are his or her arms and legs. The extent to which the driver successfully experiences the car in this way may be associated with their immediate feeling of controlling the car itself in traffic surroundings. According to Gibson and Crooks (1938) the driver perceives 'the field of safe travel' and 'the minimum stopping zone' as important limitations when driving. These terms presuppose the same kind of bodily feeling of unity with the car and its properties as suggested by Merleau-Ponty. This bodily feeling of unity and control may play a role in the regulation of the driving process. The present study aims to examine the dimensional structure of self-assessment of driving ability.

1.2 Previous research findings

Groeger and Brady (2004) examined the association between self-assessment and driver training (other than skid courses). Their findings questioned the suggestion that young drivers are especially prone to overestimating their own driving ability compared with more experienced drivers.

In driver training in Norway an explicit learning objective is to develop among learners a self-critical view of their own driving abilities (Norwegian Public Roads Administration., 2005). Hence, it is of current interest to examine the association between driver training and self-assessment. However, a distinction should be made between training undertaken with a lay instructor and training undertaken with a professional driving teacher. In Norway driver training usually consists of a mix of professional driver training and training accompanied by a lay instructor. Educational elements which are not possible to test adequately in the licensing test are addressed through mandatory lessons. These lessons include elements of theory and driving practice as well as practical evaluation lessons taken throughout the learning process. Thus, professional driving schools provide mandatory as well as optional programmes. The great majority of learners reduce their costs by supplementing the mandatory

training with accompanied training simply to gain sufficient driving experience prior to taking their driving test. Most drivers in Norway therefore will have experienced both lay and professional instruction as learners. However, the mix between the two types of driver training may differ from person to person. The present paper aims to examine the associations between driver training and self-assessment related to formal as well as informal driver training on the road.

Previous research has examined the relationship between self-assessment of driving ability and other important variables such as age, driving experience and sex. However, the findings are mixed, possibly due to cultural differences, sample differences and different measurement instruments. Young drivers assess their driving ability to be better compared to that of older drivers (Katila, Keskinen, Hatakka, & Laapotti, 2004; Matthews & Moran, 1986; National Highway Traffic Safety Administration (NHTSA), 1998; see also Karlaftis et al., 2003). This may support the view that unrealistic self-assessment may be one reason behind young drivers' relatively high accident record. However, research regarding the relationship between age and self-assessment has reported mixed results. McCormick et al. (1986) did not find any relationship between age and self-assessment, whereas other studies have given positive support to this finding (Delhomme, 1991; Goszczyńska & Roslan, 1989; Lajunen et al., 1998). Some studies have shown the association between age and self-evaluation to be moderated by driving experience (Groeger & Brown, 1989; Sivak, Soler, & Tränkle, 1989). Furthermore, DeJoy (1992) found a positive association between age and self-assessment of skills.

Goszczyńska and Roslan (1989), Katila et al. (2004), and Groeger and Brady (2004) have all found a positive association between self-assessment and driving experience. Also, Spolander (1983) found a positive association between self-assessed skills and driving experience, though driving experience was not found to influence the aspect 'safety orientation'.

Further, previous research has reported mixed results with regard to gender differences. Several studies have shown women to be less confident compared to men when they evaluated their own driving skills (DeJoy, 1992; Gregersen & Nyberg, 2002; Lajunen et al., 1998; Sivak et al., 1989; Spolander, 1983). However, the gender differences seemed partially to depend on driving experience (McKenna, Stanier, & Lewis, 1991). In contrast, other studies do not support the finding that there are gender differences in

drivers' self-assessment (e.g. Delhomme, 1991; Groeger & Brown, 1989; Lajunen & Summala, 1995; McCormick et al., 1986).

Although self-assessment is assumed to be important in explaining young drivers' risk of involvement in accidents, self-assessment of driving ability as a risk factor for crash involvement needs to be investigated further (Deery, 1999). Accordingly, the present study aims to examine this relation.

1.3 Measuring self-assessed driving ability

In previously validated measurement instruments drivers have been asked to compare their abilities in relation to the average driver, a novice driver, or an expert driver. An alternative measurement strategy could be to ask drivers to make direct evaluations of their ability. There are several arguments in favour of measuring by direct evaluation. The first argument is that the concept of 'the average driver' is a pejorative term. The second argument is the ambiguity related to such comparison standards. It is well known that people make more positive judgments of themselves when the standards they are asked to compare themselves with are either ambiguous or unclear, such as the average driver, a novice driver, or an expert driver (Dunning, Meyerowitz, & Holzberg, 1989; Groeger, 2000; Groeger & Grande, 1996). Dunning et al. (1989) concluded that people provide self-serving assessments to the extent that the trait is ambiguous, i.e. to the extent that it can describe a wide variety of behaviours, and that such a self-serving pattern disappears once the criteria for judgment are clearly established. As a result of self-serving mechanisms young drivers may have been led to claim a level of driving ability they had not really attained¹. In a specific driving situation, for example while driving with peers as passengers, self-serving mechanisms may inhibit a sound regulation of the driving process, forcing drivers to take decisions with regard to speed and driving style when in fact they do not feel confident in this respect.

The present study aims to measure self-evaluation by applying the direct strategy for measuring self-assessment of driving ability. To reduce ambiguity it may be argued that

¹ The problem with this is twofold. First it is impossible to assess how far educational aims are fulfilled if the self-assessment measure is contaminated with self-serving assessments. Subsequently, it is debatable as to how well self-assessment influenced by self-serving assessments really reflects the feeling of ability in a specific and demanding driving situation, i.e. to what extent it is relevant to the regulation of the driving process. If it is not relevant to the regulation it is not relevant as a measure to assess the over-estimation hypothesis either. For the purpose of the present study it is important to create a measure of self-assessment of driving ability that can be an outcome variable for the effect of driver training.

a measurement instrument of self-assessed driving ability should have a high level of specificity. This is in line with Dunning et al. (1989), and also with findings from self-efficacy research indicating that the more specific the description of the task, the more predictive value the measured self-efficacy has with regard to actual performance (Pajares, 1996). This is also in accordance with the theory of planned behaviour (Ajzen & Fishbein, 1980), which claims that the predictor and the effect variables should have the same level of specificity in order for the prediction to be successful. Accordingly, the new measurement instrument will enable the exploration of new items with a high level of specificity.

Thus, the core aim of the present study is to examine the psychometric qualities of a measurement instrument for self-assessment of driving ability, including a possible body dimension. The specific aims of the study are to examine: (1) the role of driver education in such self-assessment, (2) the associations between self-assessment, age and driving experience, (3) gender differences in self-assessment of driving ability, and (4) the association between self-assessment and crash involvement.

2. Method

2.1 Sample

The respondents in the study were a sample of the Norwegian population of young drivers in the age group 18–20 years. A total of 4000 persons were selected randomly from the official driver licence registry AUTOSYS among those fulfilling the age criterion. They all held a driving license for passenger cars. The minimum age for licensing in Norway is 18 years, which implies significant variations among the respondents with regard to driving experience. The drivers responded to a mailed questionnaire. The data were collected during autumn 2005 and spring 2006. A total of 167 questionnaires were returned because of unknown addresses, and 1419 replied to the questionnaire (response rate 37%), of which 721 were women and 698 men, (50.8% and 49.2%, respectively, of those who responded). Of the original sample as a whole, 45% were female and 55% were males. The collective response rate from the four largest cities in Norway was 35.1%, while for other parts of the country it was 37.3%.

2.2 Questionnaire

To measure self-assessment of driving ability a 31-item measurement instrument developed for the purpose of the study was applied. The questionnaire was based on

two other instruments aimed at measuring self-assessment of driving ability (Gregersen & Nyberg, 2002; Spolander, 1983). All 11 items from the questionnaire of Gregersen and Nyberg (2002) were chosen. Of these, 10 were in common with Spolander's (1983) questionnaire. Spolander had three additional items, two of which were used for exploring new items. Thus, when these were added, the present study's questionnaire had a total of 13 items. A further 18 items were explored. The basis for exploring and selection of items were as follows:

1. They must be of relevance as measurement instruments related to driver training and licence testing, i.e. they have to describe skills and ability related to the training syllabus.
2. It is of interest to explore items related to a possible body dimension to examine whether these items gravitate into the general driving ability dimension or are extracted as a separate dimension.
3. It is necessary to explore specific skill items leaving no doubt with regards to interpretation and knowing whether or not they fit the actual respondent's skills. This is also used to examine whether or not these are extracted separately from other dimensions.
4. They are to be used in a Nordic context.

A group of experts within the field was consulted with regard to exploring and selecting items. The group comprised one professor at the Department of Psychology at the Norwegian University of Science and Technology and one senior adviser in the Norwegian Public Roads Administration (NPRA) who had experience of syllabus development and implementation, counselling in driving schools, and licence testing. In addition, one accident investigator with experience of in-depth studies of young drivers' involvement in accidents within the analysis group of NPRA was included in the group.

Gregersen and Nyberg (2002) and Spolander (1983) asked respondents to compare themselves with drivers in general and to rate their own ability on a five-point scale ranging from 'much better' to 'much poorer' (than car drivers in general). In accordance with the reasoning presented, the wording in all items was constructed as statements describing the respondent with different skills, traits and experiences as a car driver, and the respondent was asked to assess how correctly the statement fitted him or her on a scale in which the alternatives were: (1) completely correct, (2) mostly correct, (3) neither–nor, (4) mostly wrong, and (5) completely wrong.

The amount of formal training was measured by asking how many practical driving lessons (other than mandatory lessons) they went through since they started by the

driving school and until licensing. Informal driver training was also measured by self-report by asking how many times they had driven with a lay instructor through their learning period. To help them estimating this it was given some examples: '3 times a week in two years will give approximately 300 shifts, and two times a week in one year will give approximately 100 shifts'. The respondents were asked to report a reasonable estimate with regard to numbers of shifts. In addition they estimated an average length of a shift.

In addition, the questionnaire contained demographic variables relating to gender, age and geography. Driving experience was measured by asking how often the respondents drove, approximately how many kilometres they drove every month, and how long they had held a driving license. This information was used to estimate the respondents' amount of driving experience gained after they had received their driving license.

The respondents were also asked about any crash involvement during the first 6 months after licensing, and thereafter for the next 6-month period and up to the time when they completed the questionnaire. To avoid tendency of under-reporting crash involvements it was emphasized that all crash involvement should be reported, regardless of who was responsible for the crash. Also crashes involving only material damage were reported. The information regarding self-reported previous crash involvement gave the basis for a calculated risk measure (see Section 2.3). In the current sample the term risk refers to this measure.

2.3 Statistical analysis

To examine the dimensionality of self-assessment of driving ability, an explorative factor analysis was carried out. A Principal Component Analysis (PCA) with Varimax Rotation was conducted. In order to exclude unreliable items from further analysis, items with a factor loading of lower than .45 were excluded. Also items with cross-loadings higher than .40 were excluded from further analyses. In order to strengthen the basis for assessment of the dimensional structure The Linear Structural Relation (LISREL) analysis program (Jöreskog & Sörbom, 1993) was used to conduct two confirmatory factor analyses. The first analysis was conducted with the four factors as explored in the PCA. The second analysis was conducted with two factors based on the dimensionality identified in previous research.

Cronbach's (1951) alpha coefficient was applied to evaluate the homogeneity of the items within the self-assessment dimensions. According to Nunally (1978) an alpha-value of .70 or higher is considered satisfactory, hence this criterion was applied in the present study. Regression analysis was carried out in order to examine the associations between self-assessment dimensions on the one hand and age and driving experience on the other hand.

Pearson's r and multivariate analysis of variance (MANOVA) were used to examine the association between self-assessment on the one hand and driver training, driving experience, gender and risk on the other hand. The risk measure was calculated as follows:

$$\text{Risk} = \text{Number of crash involvements} \times 100/\text{km driving experience}$$

3. Results

The results of the exploratory factor analysis showed that self-assessment fell into four dimensions, consisting of 22 items (Table 1). The first dimension related to self-assessment of *General driving ability*, which included skills such as driving fast, anticipating, driving in slippery conditions, and driving in the dark. The second dimension, *Safety orientation*, referred to the driver's judgment of themselves in relation to risk, danger and safe driving. The third dimension was *The body dimension*, which measured the feeling of unity with and control of the car. The fourth dimension was *Specific task skills* and items under this dimension consisted of judgment of the ability for precise and effective parallel parking, reversing into a garage, as well as reversing using the rear-view mirrors. The Cronbach's α were found to be satisfactory for all four dimensions (Table 1).

Table 1 also shows the average corrected item-total correlation coefficient, as well as the explained variance of each factor. A significant association was found between the four dimensions of self-assessment of driving ability ($p < .001$) (Table 2). The most significant coefficient was found between *General driving ability* and *The body dimension* $r = .64$. All correlation values were between .64 and .49, except for the correlation between *Safety orientation* and *Specific task skills* ($r = .35$). The latter dimension differed from the others in being a vehicle manoeuvring skills dimension. In order to test the robustness of the four-dimensional factor model two confirmatory factor analyses were conducted using LISREL (Jöreskog & Sörbom, 1993). The model

fit of the four-dimensional structure was found to be satisfactory (RMSEA = .059, GFI = .92, AGFI = .90, CFI = .97). A two-factor model based on dimensionality identified in previous research was also tested. However, the two-factor solution did not achieve a satisfactory fit (RMSEA = .087, GFI = .85, AGFI = .82, CFI = .94).

Table 2 shows the association between all of the dimensions, driver training and driving experience (Pearson's r). There were significant though not strong coefficients. Also, Table 2 shows that the higher the amount of instruction taken at driving schools, the lower the self-assessment rating was. In contrast, the higher the amount of lay instruction, the higher self-assessment was. After controlling for driving experience following licensing using partial correlation analysis, the correlation pattern remained more or less the same. It was only a little weaker, indicating that differences in driving experience between the two groups are not an important part of the explanation for the differences between the two kinds of driver training. There were significant though low correlations between the four dimensions and driving experience, respectively Pearson's $r = .26$, $p < .0001$ (general driving ability), $r = .07$, $p < .01$ (safety orientation), $r = .21$, $p < .001$ (the body dimension), and $r = .31$, $p < .001$ (specific task skills).

Table 1: Dimensions of self-assessment of driving ability

Dimensions (Cronbach's α and average item-total correlation)	1	2	3	4
<i>Dimension 1: General driving ability</i>				
<i>(Cronbach's α: .85, average item-total correlation = .58, Rotation sums of squared loadings = 17.72)</i>				
I am a champion on slippery conditions	.72	.11	.16	.22
I am well skilled to drive fast if necessary	.69	.09	.23	.15
I drive effectively under high traffic density conditions	.64	.12	.11	.11
I am well skilled to anticipate	.63	.33	.19	.10
I always judge gaps in traffic flow correctly	.59	.24	.11	.09
I have excellent driving skills	.58	.33	.17	.16
I am well skilled in dark driving	.58	.29	.19	.15
I know exactly how to turn the wheel when skidding	.57	.13	.25	.29
<i>Dimension 2: Safety orientation</i>				
<i>(Cronbach's α: .70, average item-total correlation = .45, Rotation sums of squared loadings = 12.32)</i>				
Dangerous situations rarely occur abruptly for me	.16	.66	.07	.11
I have a driving style avoiding dangerous situations	.01	.65	.09	-.07
I am pretty good at driving safely	.23	.64	.14	.10
I recognize dangerous situations	.14	.50	.21	.23
I feel confident to cope with unexpected situations	.24	.50	.30	.27
I have lower accident risk than the average driver	.36	.47	.16	-.02
<i>Dimension 3: The body dimension</i>				
<i>(Cronbach's α: .79, average item-total correlation = .57, Rotation sums of squared loadings = 12.31)</i>				
I have the feeling of direct contact with the road surface	.14	.22	.75	.11
The car and I are united	.24	.09	.74	.04
I know immediately if my car fits into a narrow passage	.28	.13	.62	.35
I know exactly the position of the car	.20	.33	.53	.26
I know the exact stopping distance needed for maximum braking	.36	.26	.51	.15
<i>Dimension 4: Specific task skills</i>				
<i>(Cronbach's α: .76, average item-total correlation = .60, Rotation sums of squared loadings = 10.63)</i>				
I am able to reverse fast and precisely into a garage	.23	.09	.14	.82
I am able to reverse easily by using rear-view mirrors	.13	.06	.14	.76
I am well skilled in fast and precise parallel parking	.24	.12	.16	.72

Extraction method: Principal Component Analysis

Rotation method: Varimax

Sum of explained variance: 52.98%

Table 2: Correlation matrix between self-assessment dimensions, driving experience and driver training with a lay instructor versus driver training with a professional driver teacher

	General driving ability	Safety orientation	The body dimension	Specific task skills	Amount of lay instruction	Lessons with a driving school
General driving ability	1					
Safety orientation	.59***	1				
The body dimension	.64***	.58***	1			
Specific task skills	.52***	.36***	.51***	1		
Amount of lay instruction	.11***	.05	.13***	.28***	1	
Lessons with a driving school	-.18***	-.11***	-.12***	-.23***	-.19***	1
Driving experience	.26***	.07**	.21***	.31***	.13***	-.13***

** = $p < .01$

*** = $p < .001$

Table 3 shows the results of four regression analyses where the self-assessment dimensions are the dependent variables and age and driving experience are the independent variables. There were no significant associations between age and the self-assessment dimensions except for safety orientation, where there was a weak but significant association. Driving experience was significantly associated with all of the self-assessment dimensions with exception of the safety orientation dimension.

Table 3: Regression analyses of dimensions of self-assessment and age and driving experience.

	B	t	F
General driving ability			48.12
Age	-.013	-0.46	
Driving experience	-.25	-9.02***	
Safety orientation			9.37
Age	-.10	-3.40**	
Driving experience	-.04	-1.31	
The body dimension			33.24
Age	.02	0.73	
Driving experience	-.22	-7.86***	
Specific task skills			70.92
Age	.01	0.48	
Driving experience	-.31	-11.32***	

** = $p < .01$

*** = $p < .001$

Table 4: Multivariate analysis of variance for dimensions of self-assessment of driving ability by risk, gender and driving experience

	<i>General driving Ability</i>		<i>Safety Orientation</i>		<i>The body dimension</i>		<i>Specific task skills</i>		Wilk's λ	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	P	
<i>Risk</i>									.95	.000
0	3.03	0.637	3.63	0.544	3.30	0.679	3.12	0.923		
.002-.0108	3.40	0.678	3.65	0.575	3.63	0.673	3.66	0.844		
.0110-.0300	3.09	0.638	3.56	0.542	3.26	0.688	3.12	0.927		
.0301-.0600	3.00	0.557	3.46	0.480	3.29	0.659	3.11	0.948		
.0601-.1000	2.99	0.735	3.57	0.543	3.29	0.718	3.12	1.045		
.1001-.4000	2.89	0.506	3.45	0.477	3.25	0.749	2.86	0.896		
> .4000	2.82	0.656	3.33	0.591	3.02	0.732	2.53	0.857		
F-value	1.57		2.60		2.68		2.00			
P	.151		.016		.014		.063			
<i>Gender</i>									.97	.000
Females	2.86	0.580	3.54	0.519	3.17	0.681	2.82	0.918		
Males	3.26	0.640	3.64	0.560	3.47	0.676	3.47	0.843		
F-value	28.32		2.04		8.46		16.72			
P	.000		.154		.004		.000			
<i>Driving experience</i>									.98	.004
< 1000 km	2.81	0.607	3.50	0.523	3.11	0.658	2.75	0.885		
1001-8000 km	3.06	0.604	3.60	0.546	3.31	0.654	3.10	0.908		
> 8000 km	3.26	0.668	3.64	0.543	3.50	0.717	3.51	0.886		
F-value	2.75		0.83		2.91		3.64			
P	.065		.436		.055		.027			

$$\text{Risk} = \frac{\text{Number of accidents} \times 100}{\text{Km driving experience}}$$

Respondents were asked to assess how correctly self-assessment statements fitted them on a given scale, where the alternatives were: (1) Completely correct (2) Mostly correct (3) Neither-nor (4) Mostly wrong (5) Completely wrong. High mean values correspond to high ratings.

Table 4 shows that there were significant differences in drivers' self-assessment due to risk, gender and driving experience. The results also show that the greater the risk, the lower the self-assessment. Further, Table 4 shows that the male respondents assessed their driving ability to be better compared to that of female respondents. There was a positive association between driving experience and the respondents' tendency to evaluate their own driving ability positively.

Further, Table 4 shows that there were significant though weak associations between self-assessment of driving ability and accident risk. As expected, the coefficients were stronger when the analyses were based solely on drivers who had been involved in an accident (Table 5).

Table 5: Correlations between the 4 dimensions of driving ability and risk

Pearson's r	All drivers	Drivers with accidents
	N = 1419	N = 587
	Risk	Risk
<i>General driving ability</i>	-.07**	-.15***
<i>Safety orientation</i>	-.09**	-.10*
<i>The body dimension</i>	-.08**	-.14**
<i>Specific task skills</i>	-.12***	-.22***

* = $p < .05$

** = $p < .01$

*** = $p < .001$

The two new dimensions for self-assessment labelled the body dimension and the specific task skills seemed to have an equal association with risk when compared to the two factors of driving ability identified in previous studies (e.g. Lajunen & Summala, 1995; Spolander, 1983; Svenson, 1981). This was especially true for specific task skills. It is apparent that novice drivers, until they have experienced a crash, belong to a 'zero-risk' group in terms of the applied risk measure. Consequently, the association between risk and self-evaluation was expected to be low. When drivers who had experienced accidents were analysed separately from all other drivers the correlation coefficients were higher, as expected.

In addition, a multivariate analysis of variance was carried out. The risk estimate was recoded into seven groups, ranging from low to high risk. As anticipated, there were significant differences in self-assessment between the groups. The more favourably the respondent perceived their driving ability to be, the lower the risk (Wilk's $\lambda = .855$, $p < .001$).

4. Discussion

The core aim of the present study was to examine the psychometric quality of a measurement instrument for self-assessment of driving ability. The results showed that self-assessment fell into four dimensions: (1) general driving ability, (2) safety orientation, (3) the body dimension, and (4) specific task skills. Additional confirmatory factor analyses using LISREL showed satisfactory model fit to the four-factor solution. The fit of the model to the data was not satisfactory to the two-factor solution. Thus, the findings of the present study did not support the dimensional structure identified in previous research. Hence, it seems appropriate to conclude that the use of four dimensions is the best solution for existing data. As mentioned (see Section 1.1), the great majority of studies carried out previously have focused on the two first-mentioned dimensions. The present study provided new dimensions of driver skills related to specific task skills and a dimension labelled the body dimension.

4.1 Self-assessment and driver training

Professional instruction was negatively associated with self-assessment of skills, while lay instruction was positively correlated to self-assessment. In this respect the present study did not seem to confirm unrealistic self-assessment as a side effect of professional driver training. This is in contrast to findings by Gregersen (1996) and Keskinen et al. (1992). However, the present study examined practical driver training in general, mainly elementary pre-licence training. It is still possible that there are aspects of more specialized driver training, such as skid training, where unrealistic self-assessment of skills are a side effect, in line with previous research. However, the present study showed that this is not necessarily the case for all aspects of professional practical driver training.

One possible explanation for the negative self-evaluation among those who reported high amounts of formal training may be that the training focused on the problem of overconfidence, in accordance with educational aims expressed in the GDE-model and the learning objectives in the present driver training curriculum (Norwegian Public Roads Administration, 2004). Thus, the results indicate that formal training contributes to addressing the problem of overconfidence and may lead learners who have taken many professional driver training lessons to adopt a more self-critical view of their own driving ability.

Another explanation for the differences in self-evaluation could be that those who were already more self-critical or less competent attended more professional lessons. In this respect, the respondents' self-evaluation may reflect their driving aptitude. However, it is also possible that there may have been external causes for which type of training individual respondents opted for. Young drivers who have easy access to a car and a lay instructor may tend to choose informal training in order to reduce costs, while those with limited access to such means may tend to seek formal training. This may also contribute to the need for a larger number of formal lessons. In addition, there may be a geographical dimension; namely, it may be easier to perform informal training in rural areas compared to in urban areas. Thus, the type of training may be at least partly the result of circumstances which are not related to the learner's driving aptitude.

4.2 Self-assessment, age and driving experience

The regression analyses shown in Table 3 show that safety orientation was the only dimension significantly associated with age and not with driving experience. The association was significant, though not strong. However, due to the narrow age range in this sample, it was considered unlikely that any strong effects of age would emerge from the analysis in the present study. All the other dimensions were significantly associated only with driving experience.

These findings may indicate that the upper levels in the GDE-matrix regarding goals and context of driving and also goals for life and skills for living (Hatakka et al., 2002; Peräaho et al., 2003) depend on maturity rather than driving experience. The findings showing self-assessment of driving ability to be positively associated with driving experience support the findings of Goszczynska and Roslan (1989), Katila et al. (2004), and also Groeger and Brady (2004).

4.3. Self-assessment and gender

As expected, female respondents assessed their driving skills to be significantly lower compared to male respondents. However, for safety orientation there was no significant gender difference. The gender differences did not seem to depend on driving experience. Thus, the results neither support Groeger and Brown (1989) nor McKenna et al. (1991). The role of exposure for gender differences in self-assessment seems to be undecided. The present study examined young drivers aged between 18 and 20 years.

The differences between the two previous studies and the present study may be due to demographic and cultural sample differences.

4.4. Self-assessment and risk

The study showed that there was a significant association between self-assessment and risk as well as driving experience. The better the respondents perceived their driving ability to be, the lower their level of risk proved to be. The youngest drivers and the less-experienced drivers were the most self-critical respondents. If risk is taken as a measure of actual driving ability, this finding may indicate that young drivers have a realistic view of their own driving ability and that parallel development of self-assessment of driving skills and actual driving skills takes place after licensing. Thus, the results did not support previous studies concluding that young drivers tend to overestimate their own driving ability (Gregersen, 1996; Keskinen et al., 1992). The findings of the present study therefore may indicate that overestimation of driving skills is a minor safety problem among young drivers. If so, it is necessary to look elsewhere for the reason why so many young drivers are involved in accidents.

There may be several explanations for the finding that young drivers seem to have a fairly realistic view of their own driving ability. Firstly, it may be due to the different methods used to measure self-assessment of driving ability. The finding may result from avoiding some sources of self-serving biases in the new measurement instrument. Alternatively, it may reflect the cultural differences between Norway and other countries. However, there is little reason to believe that there are major cultural differences between other countries and Norway. The association with risk indicates that the achievement of the educational goal or the driver's prior critical view of their competence is not sufficient to compensate for lack of driving skills. It seems likely that lay instruction and driving experience contribute to development of skills which lower the risk of accidents despite the growth in self-assessment.

4.5. Consequences for driver training

Despite evidence to suggest that young drivers are able to make a realistic self-assessment and given that drivers with the most self-critical judgment of their own abilities have the highest risk of being involved in an accident there seems to be a need for strengthening skills training in driver education in order to reduce accident risk. One problem with skill-oriented driver education may be that it is hardly possible to achieve

improved driving skills during the course of the few lessons available provided under the training curriculum. The study made by Gregersen (1996) showed no improvement of actual skills despite the skill orientation of the courses and higher self-assessment. The hypothesis concerning overestimation of driving skills as a possible explanation for young drivers' high accident rates has led to the conclusion that it is important to prevent overconfidence among young and inexperienced drivers by avoiding a skill-based strategy in driver training. This may have led to a general underrating of skills training at the sacrifice of important developments in driving skills. However, it may be that adequate driving skills can be learned best within practical driver training in real traffic surroundings.

The present study showed that driver training taken with a lay instructor in addition to driving experience contributed to a higher rating in self-assessed driving abilities. The question is whether actual skills improve parallel to the growth in self-confidence. The association between lay instruction as well as driver experience and risk points to such a parallel improvement of actual driving abilities. This is in line with previous research that has shown lay instruction contributes to reduced risk (Gregersen & Nyberg, 2002; Sagberg, 2000) and enhanced self-assessment of driving skills. Further research is required to clarify the optimal mix between lay instruction and formal driver training. This should also include specific skills training aimed at reducing young drivers' risk-taking.

Further research is necessary to cover the two upper levels in the hierarchy of the GDE-model. There is reason to believe that a measurement instrument is needed to tap self-evaluative skills in a wider sense than that directly relevant to regulation and calibration of the driving process. This would be in accordance with the emphasis placed on the social context and more general goals in life. To elucidate this it will be of interest to examine the importance of self-evaluation skills compared to the importance of attitudes and self-reported driver behaviour in relation to young drivers' accident risk. The present study provides a measurement instrument for making such comparisons possible. Further research should also examine the way in which self-assessment influences driver behaviour.

The results of the present study were based on self-reports. Self-report of accidents may be biased by underrating of accidents. It is not expected that there will be any differences in under-reporting of accidents due to age, gender, driver experience, and

type of driver training. In addition, to some extent accidents are a stochastic variable. The use of driving experience as a denominator in a risk measure will serve to raise the risk rate more should an accident occur earlier in the driving career rather than any accident which may occur later in the driving career (Laapotti, Keskinen, Hatakka, & Katila, 2001). However, this may represent a source of bias.

Measurement self-assessment of driving ability may be a necessary aspect of the licensing test to ensure achievement of the learning objectives with regard to self-evaluation. The present study contributes to the development of such an instrument.

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Paper II

Associations between driver training, determinants of risky driving behaviour and crash involvement

Torbjørn Tronsmoen

Department of Psychology
Norwegian University of Science and Technology,
N-7491 Trondheim, Norway

Norwegian Public Roads Administration
Eastern Region, P.O. Box 1010 Skurva,
N-2605 Lillehammer, Norway

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Associations between driver training, determinants of risky driving behaviour and crash involvement

Torbjørn Tronsmoen

Department of Psychology, Norwegian University of Science and Technology,

N-7491 Trondheim, Norway

Norwegian Public Roads Administration, Eastern Region,

P.O. Box 1010 Skurva, N-2605 Lillehammer, Norway

Abstract

The core aim of the study is to examine associations between formal and informal practical driver training as well as driving experience on the one hand and young drivers' safety attitudes, self-assessment of driving ability and self-reported driver behaviour on the other hand. An additional aim is to examine the associations between attitudes, self-assessment and behaviour on the one hand and crash involvement on the other hand. The results are based on a self-completion questionnaire survey conducted among a representative sample of Norwegian drivers aged 18–20 years ($n=1419$). The results showed that there were small yet significant associations between driver training, on the one hand and traffic safety attitudes and risky driving behaviour on the other hand. The amount of formal driver training was negatively associated with the respondents' evaluation of their driving skills; although the amount of lay instruction was positively associated with such self-evaluation. The results also showed that attitudes as well as self-assessment of driving ability were significantly associated with self-reported risk behaviour. This was especially true for attitudes related to rule violations. There was a strong association between crash involvement and exposure (measured as months holding a licence). Young novice drivers' crash involvement seems stronger associated with driving skills (manifested as self-assessment of driving ability) than safety attitudes and self-reported driver behaviour. The consequences of the results for driver training and accident prevention are discussed.

Keywords: driver training; self-assessment of driving ability; safety attitudes; risk behaviour; crash involvement

1. Introduction

Young drivers are overrepresented in crash and traffic fatality statistics. In member countries of the Organisation for Economic Co-operation and Development (OECD, 2006) between 18% and 30% of killed drivers are between 15 and 24 years old, although the same age group constitutes only between 9% and 13% of the population in their countries. However, there is a significant decrease in the number of accidents among young drivers during the first six to eight months after passing their driving test (Sagberg, 2000; Mayhew et al., 2003). The strong decrease in crashes during a limited time demonstrated by the empirical findings indicates the risk reduction to be a result of driving experience, and experience to be a main factor in developing driving competence. This effect does not necessarily result from developing essential driving skills, it may also for example be owing to a positive association between driving experience and safety attitudes. Grasping the primary elements of such a learning process seems important in efforts for enhancing the quality of driver training. Experience and time spent on individual tasks are an essential part of the skill acquisition process (Dreyfus & Dreyfus, 1986; Groeger, 2000). Consequently, it may benefit to provide young drivers as much driving experience as possible before licensing. Due to this, lay instruction is given an important role in the Norwegian driver training system.

Educational efforts are commonly considered successful if learning objectives are met and the students are passing the examinations or tests in the end of the course. Yet, driver education has a wider purpose, owing to the expectations to produce road safety effects. However, crash involvement is a difficult output variable measuring effects of driver training. One explanation for the difficulty to show such connections has been that accidents are rare incidents, which make it difficult to show near associations between educational measures and accidents (e.g. Engström et al., 2003). One possibility is to measure safety effects by using determinants of crash involvement as substitutes for safety. It is an important learning objective in the Norwegian driver training curriculum to influence safety attitudes, self-evaluation skills and safe behaviour in order to producing safe drivers (Norwegian Public Roads Administration, 2004). These variables are more suitable for reliable measurement at individual level; provided that the context is neutral and the test is carried out anonymously. However, researchers have also emphasised that many determinants of accidents, such as attitudes, are at another level of specificity than accidents (Iversen, 2004; Stene, 2005; Ulleberg, 2002), which also makes it difficult to show near associations.

The relationship between practical driver training and safety attitudes, self-evaluation skills and behaviour are sparsely examined. Lay instruction is aimed at providing driving experience and to bring forth the safety effects of driving experience. An underlying assumption is that lay instruction will provide a safety effect similar to the effect obtained by driving alone. Driving experience may produce safety effects due to improved driving skills or the safety effect may be caused by improved safety attitudes. Driving experience may contribute to young drivers' understanding of how far various attitudes and behaviours related to safety are safety effective. If so, informal lay instruction may contribute to fulfil official learning objectives and thus may partly replace formal driver training. However, it is an underlying premise for using safety attitudes, self-evaluation skills and safe behaviour as outcome variables that they may result from driver training and that they are associated with crash involvement. Consequently, the present paper aims at *examining the associations between formal and informal practical driver training as well as driving experience on the one hand and safety attitudes, self-assessment of driving ability and self-reported driving behaviour on the other hand. The relationship between attitudes, self-assessment and driving behaviour on the one hand and accident involvement on the other hand is also examined.*

Development of driving competence is described in several theoretical models. In this paper Dreyfus and Dreyfus (1986) and the Goals for Driver Education – (GDE) model (Hatakka et al., 2002; Peräaho et al., 2003) are taken as examples. Dreyfus and Dreyfus see driving competence primarily as a skill, and developing competence mainly resulting from extensive practice in the domain. The GDE-model has a wider focus and identifies attitudes and self-assessment of driving ability as important, safety relevant targets for influence by driver training.

According to Dreyfus and Dreyfus' five-stage model, initially a 'novice' primarily depends on context-free rules to act (Dreyfus & Dreyfus, 1986; Wackerhausen, 1997). Acquisition of driver skills implies an enhanced understanding of the context in which the rules are applied. The 'advanced beginner' will interpret the rules in elucidation of the current traffic situation and will be able to place the rules into the context. When a driver reaches the stage of 'competence', he or she links decision-making to emotional involvement, because of the complexity and uncertainty in given situations. Resulting positive and negative emotional experiences will strengthen successful responses and inhibit unsuccessful ones, and the rules and principles formerly used as guidance for

acting will gradually be replaced by situational discrimination, accompanied by associated response. When a driver has reached the stage of 'proficiency', reading of the current situation happens intuitively although the decision to act remains the result of specific considerations. At the stage of 'expertise', the expert will be able to perform immediately and intuitively in a domain, based on his or her response to a given situation. Such immediate and intuitively based responses will replace reasoned responses (Dreyfus & Dreyfus, 1986). In the advanced stages of the model, it will be expected that the rules will be less important in the driver's performance. Hence, dependence on the rules will be reduced. However, the skill model does not contain reference to motivational aspects of driving. Consequently, the skill model does not differ between accidents resulting from skill deficits and accidents resulting from failures in drivers' motivation and intentions to drive safely, because the latter is overlooked in the model.

Albeit motivational aspects such as safety attitudes are absent in the model of Dreyfus and Dreyfus, it is possible to derive some consequences of their approach about the role of safety attitudes. Owing to the role of rules in the skill model, it will be expected that safety attitudes may develop in a less than ideal direction, while getting more driving experience, provided measurement of safety attitudes is linked to attitudes towards rule violations. Consequently, the skill model does not indicate change in safety attitudes as a possible explanation of the strong risk reduction with increased amount of driving experience. Due to the skill-oriented perspective in this model, the explanation of the reduced risk should be enhanced driving skills, in the present study measured in terms of self-assessment of driving ability.

The Goals for Driver Education – (GDE) model is a framework for goals and contents of driver education. Opposite to the view of the skill model, the GDE-model provides a framework emphasising the necessity of motivational and intentional aspects of driving besides the importance of skill-based competence.

The model distinguishes between four levels of driving in a hierarchy. These four levels are from bottom to top: *vehicle manoeuvring*, *mastering traffic situations*, *goals and context of driving*, and *goals for life and skills for living* (for a more thorough presentation, see Hatakka et al., 2002; Peräaho et al., 2003). It could be considered an advantage of the GDE-model that it includes a fourth level linking it to social cognition models identifying behaviour as an interaction of personal factors, such as attitudes and

self-assessment as well as the social and physical environment, see for example Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB) (Fishbein & Ajzen, 1975; Ajzen, 1991). The GDE-model suggests that the factors on the highest of the four levels are the most important for safety (Peräaho et al., 2003). Moreover, the GDE-model emphasises that the highest levels determine actions and behaviour on the lowest levels in the hierarchical model. In the GDE framework, it is argued that the goals and motives of the driver are important variables to explain young drivers' behaviour and accidents (Hatakka et al., 2002).

Compared to the skill model, the GDE-model has a broader perspective, indicating that also changes in motivational and intentional factors such as safety attitudes may be a part of the explanation of the risk reduction during the first half a year of licensed driving. The wider perspective in the GDE-model opens for driving experience as a source for strengthening ideal safety attitudes. Driving experience may contribute to understanding of the importance of appropriate safety attitudes and behaviour to avoid accident involvement in traffic.

What we can see is that the different theoretical approaches in the skill model and the GDE-model respectively, may lead to contradicting hypotheses about the relationship between driving experience and development of safety attitudes: *Based on the view in the skill model it seems likely that driving experience contributes to less ideal safety attitudes provided measurement of safety attitudes is linked to attitudes towards rule violations. In contrast, the wider perspective in the GDE-model opens for driving experience as a source for strengthening ideal safety attitudes.* However, both models consider developing driving skills as important for safety. In addition the GDE-model is stating that the driver's self-assessment of driving ability has to be in balance with actual driving skills as a base for appropriate regulation of the driving process.

1.1 Associations between driving experience and driver training on the one hand and self-assessment of driving ability, safety attitudes and risk behaviour on the other hand.

Lajunen and Summala (1995) found that development of driving skills (measured as self-assessment of driving skills) was correlated with driving experience. Also other studies have found a positive association between driving experience and self-assessment of driving ability (e.g. Goszczynska & Roslan, 1989; Katila et al., 2004; Groeger & Brady, 2004). Tronsmoen (2008) showed that self-assessment of driving

ability grew while driving experience increased and crash involvement decreased. If crash involvement is interpreted as a measure of actual driving ability, the study indicated that young drivers have a fairly realistic view of their own driving ability. The argument for such an interpretation is that safety skills and the ability to avoid crash involvement are seen as an important part of the driving ability notion (Tronsmoen 2008).

Lajunen and Summala (1995) also found that driving experience was associated with less safety and rule-oriented driving. Forsyth et al. (1995) found an increase in the number of speed violations during the first three years after gaining a licence. Furthermore, a study by Sagberg and Bjørnskau (2003) showed that how far respondents reported frequently violating traffic regulations increased with their driving experience. The study also showed that the risk level was significantly reduced during the first 9 months after licensing.

As shown, previous research have examined to which extent scores in self-assessment of driving ability, safety attitudes and risk behaviour is associated with amount of driving experience. However, little is known about how these variables are associated with the two forms of practical driver training. As mentioned previously, *this study aims at examine to which extent practical driver training is associated with safety attitudes, risk behaviour and self-assessment. Specifically, the present research examines the relative importance of formal and informal practical driver training in these factors.*

It is shown that safety attitudes may be influenced through well organised and adapted pedagogical measures, (e.g. Nyberg, 2007: 67; Senserrick & Swinburne, 2001; Nolen et al., 2002). Through official regulations and supervision it is possible to steer content and design in formal training, while informal driver training hardly may be quality assured to the same extent. Consequently, formal training may be carried out in accordance with the goals in the syllabus focusing more extensively on cognitive judgments and beliefs about hazards in traffic compared to informal training. Hence, formal driver training may be a more significant predictor of attitudes and behaviour compared to informal training. Gregersen et al. (2000) evaluated the implementation of a 16-year age limit for practicing with a lay instructor in Sweden. The results showed that despite significantly increased amounts of driving practice and improved safety due to the reform, the learners' knowledge and safety attitudes did not improve. The brief

conclusion looking at the relationship between driver training and safety attitudes is that it seems possible to influence safety attitudes significantly through education based on insight programmes. However, the relationship between *practical driver training* and development of safety attitudes has been sparsely examined.

Groeger and Brady (2004) examined the association between driver training and self-assessment of driving ability. They found that learner drivers' self-assessment increased as their amount of training grew. Tronsmoen (2008) showed that professional instruction was negatively associated with self-assessment of skills, although lay instruction was positively correlated with self-assessment. This may indicate that professionals also in practical instruction contribute to fulfil the educational goal stating that novice drivers should develop a self-critical view of their own driving ability.

1.2 Factors associated with variance in risk behaviour and crash involvement

Risk behaviour is important in traffic safety (see for example Elander et al., 1993; Parker et al., 1995). Consequently, examining the relations with possible determinants of driver behaviour may enhance knowledge relevant to improving traffic safety. Safety attitudes as well as self-assessment of driving ability may be important for driving behaviour. All these variables may in turn be important for crash involvement.

Performance as well as motivational and attitudinal factors may be important for safe driving (Rothengatter, 1997). Also according to Peräaho et al. (2003), it is important to distinguish between 'what the driver can do' (performance factors), and 'what the driver is willing to do' (motivational and attitudinal factors). Likewise, Parker et al. (1995) and Åberg and Rimmö (1998) distinguished between errors and violation in driver behaviour (Peräaho et al., 2003). Performance is linked to driving skills and the ability to avoid errors and accidents in urgent situations. On the other hand, violations relate primarily to how the driver decides to use his or her skills. In the present study these perspectives are attended to by focusing on the associations between safety attitudes and self-assessment of driving ability on the one hand, and safe driving and safety on the other hand. Self-assessment of driving ability and safety attitudes are assumed to be linked to crash involvement by their importance for risk behaviour.

The attitude-behaviour relationship is essential in both the TRA and TPB models (Fishbein & Ajzen, 1975; Ajzen, 1991). Attitudes and behaviour have been shown to

correlate provided they are measured at corresponding levels of specificity (Ajzen & Fishbein, 1977; 2005; Ajzen, 1991; Kraus, 1995). Besides attitudes, social norms are considered an important predictor in TRA. In TPB, perceived behavioural control is included as a predictor in addition to the other two factors as determinants for intention, which in turn are strongly associated with future behaviour. The term 'perceived behavioural control' refers to people's perceptions of their ability to perform in a given manner. Consequently, based on the view in TPB it will be expected that also self-assessment of driving ability has a strong relationship with driving behaviour. Self-assessment of driving ability is linked to driving skills, which also may determine crash involvement directly, because lack of skills may determine more or less risky and unintentional errors.

Several studies have confirmed that there is a strong association between safety attitudes and risk behaviour in traffic (Lajunen & Summala, 1995; Parker et al., 1995). Iversen and Rundmo (2004) found that attitudes towards traffic safety were associated with involvement in risk behaviour, especially attitudes about rule violations and speeding, as well as other forms of reckless driving. They also found that younger respondents had a greater tendency to endorse attitudes less conducive to traffic safety than older respondents did. Ulleberg and Rundmo (2002) found that the attitude dimensions explained 50% of the variance in self-reported risk-taking behaviour. In addition, their study showed that self-reported risk behaviour was a significant predictor of accidents.

In addition to attitudes, the driver's assessment of his or her driving ability may have an impact on traffic behaviour and traffic safety (see for example Brown & Groeger, 1988; Christensen & Glad, 1996; Glad, 1988; Gregersen, 1996; Keskinen et al., 1992). It seems reasonable that respondents who assess their driving abilities to be good also will perceive their driving control to be better, i.e. their driving ability will be associated with an enhanced level of perceived behavioural control, which in turn influences behaviour.

However, if dimensions of self-assessment, safety attitudes and risk behaviour are to be used as substitutes for a risk measure as outcome variables for driver training, the underlying assumption is that these variables must be closely associated with crash involvement. Hence, *it is an additional aim to examine the relations between self-*

assessment of driving ability, safety attitudes and driving behaviour on the one hand and crash involvement on the other hand.

1.3 The relationship between the variables in the study

The core aim of the study is to examine associations between formal and informal practical driver training as well as driving experience on the one hand and young drivers' safety attitudes, self-assessment of driving ability and self-reported driver behaviour on the other hand. An additional aim is to examine the associations between attitudes, self-assessment and behaviour on the one hand and crash involvement on the other hand. Figure 1 shows the variables in the study. The direction of the influence is presumed to move from the left side and to the right side of the model as the arrows indicate. However, the present study is cross-sectional and do not allow for conclusions about causality. To some extent influences may be reciprocal. The present study examines associations between actual variables as indicated by the lines.

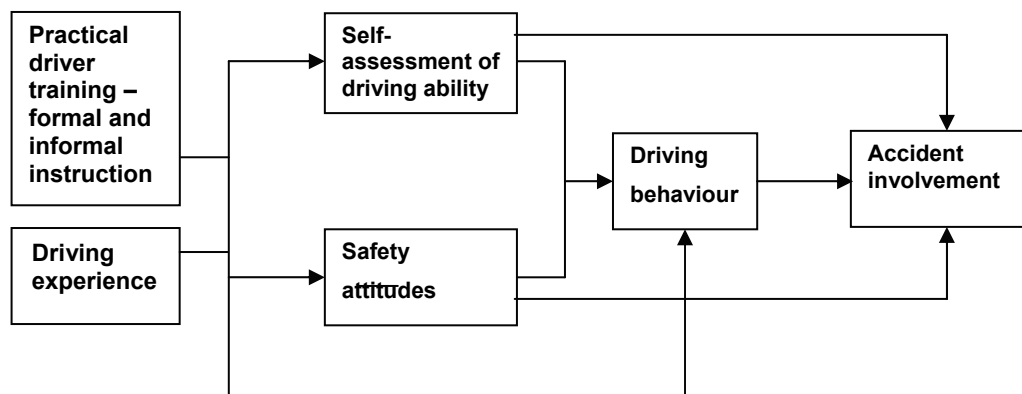


Figure 1: *The figure shows the variables in the study. The presumed direction of influence between variables is indicated by means of arrows. The present study examines associations between actual variables.*

2. Method

2.1 Sample

The respondents of the present study were a sample of the Norwegian population's young drivers aged 18–20 years. 4000 persons were randomly drawn from the official driver licence registry AUTOSYS. They all held a driving licence for passenger cars.

The minimum age for holding a driver's licence in Norway is 18 years. The drivers responded to a mailed questionnaire. The data were collected during autumn 2005 and spring 2006. 1419 respondents replied to the questionnaire. 167 were returned due to unknown addresses. The response rate was 37%. Analyses showed that the distribution of respondents were close to the distribution in the population. The respondents consisted of 49% men and 51% women, and according to Statistics Norway the actual distribution is 50.4 and 49.6. 13% of the respondents were from the four largest cities in the country. According to available licensing statistics from The Norwegian Public Roads Administration this reflects the actual distribution of 18 year olds licensed in 2005 (13.4% in the four largest cities). Note that in the licensed population the largest cities are underrepresented compared to the population as a whole, partly due to better access to public transport in urban areas.

The sample is also examined for possible selective recruitment to the two different types of practical driver training. In Norway, most of learner drivers undergo both formal and informal practical driver training. A minimum of professional driver training is mandatory, and learner drivers are free to obtain additional drivers' training with a lay instructor in an ordinary family car, provided the instructor has continually held a licence for a minimum of five years. The amount of lay instruction may of course vary from learner to learner by practical reasons.

Educational elements which are not possible to test adequately in the licensing test are addressed through mandatory lessons. These lessons include elements of theory and driving practice as well as practical evaluation lessons taken throughout the learning process. Thus, professional driving schools provide mandatory as well as optional programmes. Learners usually reduce their costs by supplementing the mandatory training with accompanied training to gain sufficient driving experience before taking their driving test. Most drivers in Norway therefore will have experienced both lay and professional instruction as learners. However, the mix between the two types of driver training may differ from person to person. In this context, selective recruitment may represent a source of bias. We actually don't know why some choose a high amount of lay instruction while others finish with more professional lessons. Choices may be influenced by external causes such as access to a car; an interested lay instructor as well as a suitable driving environment. Internal causes as for example driving aptitude, interests and personality may have an influence. In other words, it is possible that those who choose lay instruction are different in other respects than with regard to randomly

distributed external frame factors. The question is whether internal variables are linked to choices of driver training with a possibly link also to the outcome variables. In order to clarify this problem, two regression analyses were carried out with amount of lay instruction and professional driver training respectively as dependent variables. As independent variables were entered sex, degree of urbanisation in the living area in the period when driver training took place, age when lay instruction started, educational level, grades in comprehensive school in mathematics, languages, and gymnastics. These analyses showed no significant associations either for educational level or grades in comprehensive school. However, important for the amount of lay instruction and number of professional driver training lessons respectively, were time for the first lay instruction lesson, (not surprising), gender and level of urbanisation. Learners living in rural areas attain more lay instruction compared to those who live in urban areas. Men gain more lay instruction than women. This indicates that there are some external frame factors which are of influence on the amount and distribution of training.

School performance seems to be of little influence on the number of professional lessons taken. The exception is school performance in gymnastics, which is weakly (though significantly) negatively associated with the number of professional lessons. More specifically, low grades in gym class seem to lead to a need for many professional driver training lessons.

2.2 Questionnaire

The measurement instrument applied to examine self-assessed driving ability consisted of 31 indicators. The indicators fell into four dimensions, further described in Tronsmoen (2008). The first dimension related to self-assessment of *general driving ability*, which included skills such as driving fast, anticipating, driving in slippery conditions, and driving in the dark. The second dimension, *safety orientation*, referred to the driver's perception of his/her own ability to identify risk, danger and his/her perception of their ability to drive with satisfactory safety margins. The third dimension was *the body dimension*, which measured the feeling of unity with and control of the car. The fourth dimension was *specific task skills* and items under this dimension consisted of judgment of the ability for precise and effective parallel parking, reversing into a garage, as well as reversing using the rear-view mirrors. The subjects were instructed as follows: *'The next part of the questionnaire contains statements about how driving a car may be dealt with and perceived. How well do the statements fit how*

you deal with and perceive driving a car?' A five-point evaluation scale ranging from 'Fits me perfectly' to 'Doesn't fit me at all' was applied.

An 18-indicator Norwegian measurement instrument was used to measure attitudes towards traffic safety (Iversen & Rundmo, 2004; Iversen, 2004). A study examining the psychometric qualities of the instrument showed that the indicators fell into the following three dimensions: 1) *attitude towards rule violations and speeding*, including statements as 'Many traffic rules must be ignored to ensure traffic flow' and 'Speed limits are exceeded because they are too restrictive', 2) *attitude towards the careless driving of others*, including for example 'I will ride with someone who speeds if that is the only way to get home at night' and 3) *attitude towards drinking and driving*, including e.g. 'I would never drive after drinking alcohol', (Iversen & Rundmo, 2004). Ratings of the statements were given on a 5-point scale ranging from 'Strongly agree' to 'Strongly disagree'.

In order to measure self-reported driving behaviour, Åberg and Rimmö's (1998) 32-items instrument was applied. The measurement instrument from Åberg and Rimmö were based on a study by Reason et al., (1990), however extended with items constructed to fit a Scandinavian context. Åberg and Rimmö (1998) showed that the indicators fell into four dimensions: The first dimension *violations*, included items such as for example 'Deliberately disregard speed limits' and 'Disregard speed limit to follow traffic'. The second dimension, *mistakes*, referred to dangerous errors and included for example 'Misjudgement of the gap when overtaking'. The third dimension from Reason et al. (1990), harmless lapses, was split into *inattention* errors and *inexperience* errors (Åberg & Rimmö, 1998). *Inattention* included items such as 'Misread signs, find yourself lost' and 'Fail to notice green arrow'. *Inexperience* errors included for example 'Have to check gear with hand' and 'Shift into wrong gear when driving'. Ratings were given on a 6-point scale ranging from 'Very often' to 'Never'.

In addition, the questionnaire contained demographic variables concerning sex, age and education. With regard to education the questionnaire covered educational level, and grades in secondary school in mathematics, languages as well as in gymnastics. The respondents were also asked to assess the amount of driver training with a lay instructor as well as the amount of driver training with a professional driving teacher.

Driving experience was measured by asking how many kilometres the subjects drove per month, and how long they had held a licence. Also, they were asked to report any crash involvement.

2.3 Statistical analysis

Principal Component Analysis (Varimax rotation) was used to examine the dimensional structure of self-assessment of driving ability, attitudes and self-reported driving behaviour. Cronbach's (1951) alpha coefficient was applied to evaluate the homogeneity of the items within the different dimensions. Multiple regression analyses were applied to examine the influence of practical driver education as well as driving experience into variance in dimensions of self-reported behaviour, attitudes and self-assessment of driving ability. Pearson's r was calculated to show the associations between safety attitudes, risk behaviour, and self-assessment of driving ability on the one hand, and formal and informal driver training and driving experience on the other hand. The next step was to examine the importance of self-assessment and attitudes into dimensions of self-reported behaviour. This was done by applying multiple regression analyses with dimensions of self-reported behaviour as dependent variables and the other variables as independent. These analyses contained also variables controlling for interaction effects between driving experience and attitudes. The unique contribution of each of the predictor variables for the total variance explained was calculated and entered into figures in the result section. The unique contribution is calculated as follows:

$$R^2 \times 100\% = \sum_{i=1}^n \beta_i \times 100\%$$

The last question to elucidate was the relation to accident involvement. For this purpose, negative binomial regression analyses were conducted. In order to clarify possible effects of selective recruitment into the two kinds of driver training, two regression analyses were performed containing formal and informal driver training respectively as dependent variables. As independent variables were entered gender, degree of urbanisation (in the living area in the period when driver training took place), age when lay instruction started, educational level as well as grades in comprehensive school in mathematics, languages, and gymnastics.

3. Results

The Amount of Practical Driver Training

The entire sample, with exception of two of the respondents, received more professional practical driver training from driving schools than the mandatory dark driving and skid driving lessons. The mean value is 14.26 practical driving lessons attended at a driving school, while the median is 12 lessons. Standard Deviation is 9.47. 76% of the learners started their driving practice before they reached 17 years of age. Compared with Sagberg 2000 who found that 54.5% started before 17, this indicates an increase of amount accompanied driving in Norway. More than 90% did not attend any professional practical driving lessons before starting accompanied driving with a lay instructor. Almost all the respondents had private instruction of different amount in addition to the mandatory driver education in professional driving schools. The mean value of lay instruction was 114.77 h, while the median was 75 h, indicating that the distribution is skewed. The spread was considerable high with a Standard Deviation 119.04. Table 1 shows the result of simple descriptive reports. The means and standard deviations are given for driver training and driving experience as well as for self-assessment of driving ability, safety attitudes and self-reported behaviour.

Table 1: Descriptive statistics – *Safety attitudes, Risk behaviour, Self-assessment, Driver training and Driving experience*

<i>Variables</i>	<i>Mean</i>	<i>SD</i>	<i>N</i>
<i>Safety attitudes</i>			
<i>Attitude towards rule violations and speeding</i>	3.305	0.6983	1412
<i>Attitude towards the careless driving of others</i>	3.502	0.9368	1412
<i>Attitude towards drinking and driving</i>	4.749	0.6264	1411
<i>Self-reported driving behaviour</i>			
<i>Violation behaviour</i>	3.987	0.8300	1419
<i>Mistakes</i>	5.077	0.6279	1419
<i>Inattention</i>	5.189	0.5971	1418
<i>Inexperience</i>	4.914	0.6740	1419
<i>Self-assessment of driving ability</i>			
<i>General driving ability</i>	2.061	0.6419	1414
<i>Safety orientation</i>	2.591	0.5441	1414
<i>The body dimension</i>	2.319	0.6947	1409
<i>Specific task skills</i>	2.139	0.9407	1409
<i>Driving lessons in driving school</i>	14.26	9.47	1396
<i>Driving lessons with lay instructor</i>	141.98	144.96	1413
<i>Driving experience after licensing (Km)</i>	7709.81	9957.43	1381
<i>Months with a licence</i>	16.485	9.3378	1410

Attitudes: Ratings were given on a 5-point scale ranging from (1) ‘Strongly agree’ to (5) ‘Strongly disagree’. Low values correspond to non-ideal attitudes.

Self-assessment of driving ability: Ratings were given on a 5-point scale ranging from (1) ‘Strongly fits me’ to (5) ‘Does not fit me at all’. Low values correspond to low ratings of self-assessment.

Self-reported driving behaviour: Ratings were given on a 6-point scale ranging from (1) ‘Very often’ to (6) ‘Never’. Low values correspond to high ratings in all the dimensions of self-reported driving behaviour, i.e. low values correspond to non-ideal behaviour.

3.1 Self-assessment of driving ability

Tronsmoen (2008) showed that self-assessment of driving ability fell into four dimensions: 1) *self-assessment of general driving ability*, 2) *safety orientation*, 3) *the body dimension*, and 4) *specific task skills*. For further description of the dimensions, see section 2.2. The internal consistency of the indices was found satisfactory (Table 2).

Table 2: Dimensions of self-assessment of driving ability, safety attitudes and risk behaviour – Reliability

<i>Dimension</i>	<i>Number of items</i>	<i>Cronbach's α</i>	<i>Average inter-item correlation</i>
Self-assessment			
<i>General driving ability</i>	8	.85	.58
<i>Safety orientation</i>	6	.70	.45
<i>The body dimension</i>	5	.79	.57
<i>Specific task skills</i>	3	.76	.60
Safety attitudes			
<i>Attitude towards rule violations and speeding</i>	8	.83	.55
<i>Attitude towards the careless driving of others</i>	2	.73	.57
<i>Attitude towards drinking and driving</i>	2	.77	.63
Risk behaviour			
<i>Violations</i>	8	.82	.54
<i>Mistakes</i>	8	.84	.56
<i>Inattention</i>	8	.76	.46
<i>Inexperience</i>	8	.80	.50

3.2 Attitudes towards traffic safety

A principal component analysis was carried out to examine the dimensional structure of attitudes towards traffic safety. The dimensions were: 1) *attitudes towards rule violations and speeding*, 2) *attitudes towards others' careless driving*, and 3) *attitudes towards drinking and driving*. The internal consistency was found satisfactory (Table 2).

3.3 Dimensional structure of self-reported driving behaviour

A principal component analysis showed that risk behaviour comprised four dimensions: 1) *violations*, i.e. the extent to which the respondents reported violating traffic regulations; 2) *mistakes*, i.e. misjudgement of traffic situations; 3) *inattention*, and 4) *inexperience* related to driving. The dimensional structure of risk behaviour in the present sample was identical to that of Åberg and Rimmö (1998). Based on the data from the present study the reliability of the indices was found satisfactory (Table 2).

3.4 Associations between driving experience and driver training on the one hand and self-assessment of driving ability, safety attitudes and risk behaviour on the other hand.

The associations between formal and informal driver training as well as driving experience on the one hand, and attitudes, risk behaviour and self-assessment of driving ability on the other hand are shown in Table 3.

Table 3: Associations between dimensions of safety attitudes, risk behaviour, self-assessment of driving ability, and learning (Pearson's r)

	<i>Driving lessons in driving school</i>	<i>Driving lessons with lay instructor</i>	<i>Driving experience after licensing</i>
<i>Driving lessons in driving school</i>	1	-.253***	-.133***
<i>Driving lessons with lay instructor</i>	-.253***	1	.15***
<i>Driving experience after licensing</i>	-.133***	.15***	1
<i>Attitude towards rule violations and speeding</i>	.17***	-.14***	-.24***
<i>Attitude towards the careless driving of others</i>	.07**	-.01	-.06*
<i>Attitude towards drinking and driving</i>	.04	.04	-.04
<i>Violation behaviour</i>	.13***	-.12***	-.24***
<i>Mistakes</i>	.01	-.06*	-.09**
<i>Inattention</i>	-.08**	.01	-.04
<i>Inexperience</i>	-.13***	.07**	.16***
<i>Self-assessment general driving ability</i>	-.18***	.15***	.26***
<i>Self-assessment safety orientation</i>	-.11***	.06*	.07**
<i>Self-assessment body dimension</i>	-.12***	.14***	.21***
<i>Self-assessment specific task skills</i>	-.23***	.26***	.31***

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Table 3 shows that learners with the highest numbers of professional lessons were the most self-critical about their driving ability. Furthermore, the greater the number of professional lessons was reported to be, the more ideal the scores in safety attitudes

were, and the less risky behaviour was with regard to reported rule violations and speeding. In contrast, the amount of lay instruction was positively associated with the level of self-assessment. There were also correlations between the number of lay instructor lessons on the one hand, and non-ideal attitudes and self-reported risk behaviour on the other hand, i.e. the higher numbers of lay instruction lessons that was reported, the less ideal the attitudes and the driving behaviour was reported. Driving experience showed relations with self-assessment, safety attitudes and risk behaviour similar to those of lay instruction. As seen in Table 3, the correlation coefficients were small to moderate, though the majority of them were significant.

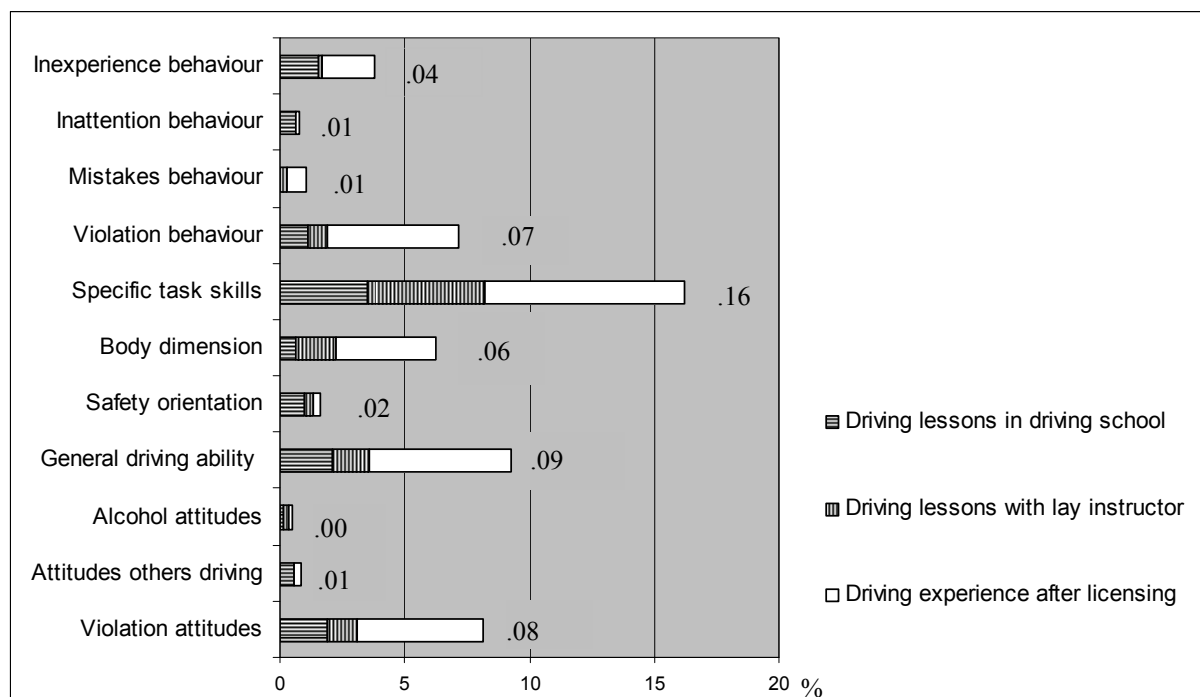


Figure 2: Results from regression analyses - Formal driver training, informal driver training and driving experience as predictors, and self-assessment, attitudes and self-reported behaviour as dependent variables – adjusted r^2 as explained variance in percent.

Figure 2 shows the results of 11 regression analyses. The aim of the analyses was to examine driving experience, professional driving lessons and amount of lay instruction as variables associated with variance in dimensions of self-assessment of driving ability, safety attitudes and self-reported behaviour. The results in Figure 2 show small to moderate associations between training and experience on the one hand and self-reported *risk behaviour* as well as *attitudes* and *self-assessments* on the other hand. The highest level of explained variance occurred in *specific task skills*, a performance

dimension of self-assessment related to vehicle manoeuvring. Also *general driving ability*, *attitudes towards rule violations* and *violation behaviour* showed moderate levels of explained variance. In general, compared to formal and informal driver training, driving experience was most important for variance in the outcome variables. There were no correlations between driving experience and the two forms of driver training on the one hand, and *attitudes towards drinking and driving* and *attitudes towards others' driving* on the other hand. There were neither found significant associations between driving experience and training on the one hand, and *inattention* and *mistakes* on the other hand.

3.5 Dimensions in self-assessment of driving ability and safety attitudes associated with variance in risk behaviour

Figure 3 shows the results of four multiple regression analyses. The aim of the analyses was to explain variance in the four dimensions of risk behaviour. The independent variables were dimensions of attitudes towards traffic safety and dimensions of self-assessment of driving ability. The most significant variable for explained variance in reported frequency of *rule violation behaviour* was *attitudes towards rule violation and speeding*. This variable was also most important for explained variance in the behaviour dimensions *mistakes* and *inattention*. Self-assessment of driving ability also contributed significantly to explained variance in behaviour. However, compared to safety attitudes, dimensions of self-assessment of driving ability were less important. The moderating effect of driving experience for the associations between attitudes and behaviour were also examined. No significant interaction effects were found.

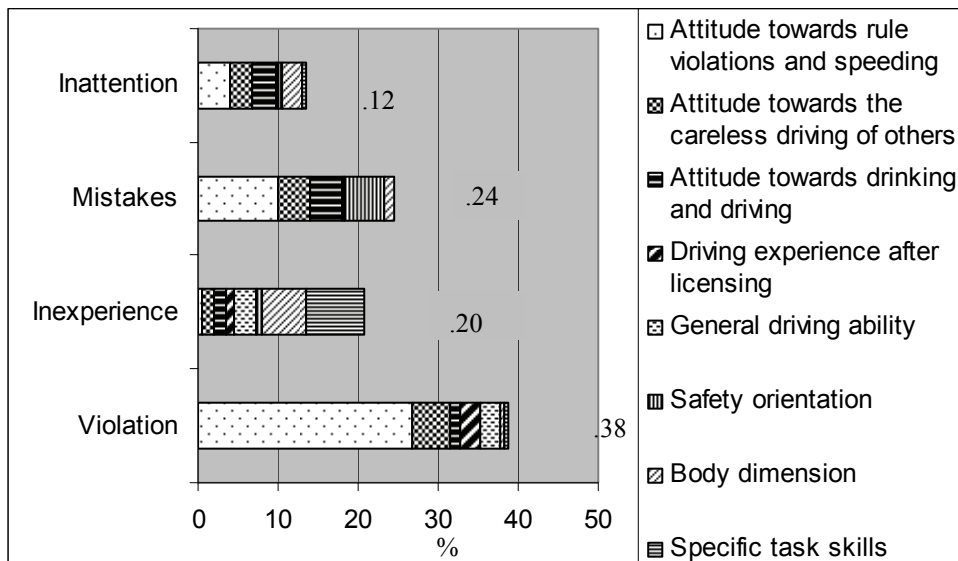


Figure 3: Results from regression analyses - Attitudes and self-assessment dimensions as predictors and self-reported driving behaviour dimensions as dependent variables – adjusted r^2 as explained variance in percent.

3.6 Associations between dimensions of safety attitudes, risk behaviour, self-assessment of driving ability on the one hand and crash involvement on the other hand

Due to the distribution in crashes, negative binomial regression analyses were applied to examine the associations between dimensions of self-assessment, safety attitudes and self-reported risk behaviour on the one hand and crash involvement on the other hand. A precondition for analyses of accident models is that the variance in accidents is mainly systematic. The systematic variance in crash involvement was calculated to 77.6 per cent. Consequently, it was reason to perform multivariate analyses to examine the relations between accidents and self-assessment, safety attitudes and risk behaviour.

The overdispersion parameter shows the part of the systematic variance in accidents not explained by the model (see the ‘Elvik index’, described in Fridstrøm et al., 1995). The formula for calculating the overdispersion parameter is:

$$\text{Overdispersion parameter } (\theta) = \frac{\frac{s^2}{\bar{X}} - 1}{\bar{X}}$$

Accordingly, the overdispersion parameter in the raw data is:

$$[(3,14033/0,7031)-1]/0,7031 = 5,476.$$

The overdispersion parameter is not standardized and may show any value higher than zero. With a good accident model fitted to the data it is to expect that the value of the overdispersion parameter will be reduced (Fridstrøm et al., 1995). LIMDEP provides the overdispersion parameter for the different models in negative binomial regression analyses. This parameter makes it possible to estimate the explained variance due to the models of self-assessment of driving ability, safety attitudes and risk behaviour, respectively. A low value in the overdispersion parameter indicates a good fit of the model. The overdispersion parameters provided from the negative binomial analyses are shown in table 4.

The negative binomial regression analysis of the self-assessment model showed the overdispersion parameter calculated to 0.8616. Variance after fitting the model to the data is calculated by inserting the value of the overdispersion parameter (θ) into the formula for the variance of a negative binomial distribution:

$$s^2 = \bar{X} (1 + \theta \bar{X})$$

$$\text{Variance} = 0.7031 \cdot (1 + 0.8616 \cdot 0.7031) = 1.129$$

The calculation showed the variance after fitting the self-assessment model to the data was 1.129

The explained part of the systematic variance is calculated by dividing the difference between the systematic variance and the difference between variance after fitting the model and the mean of accidents in the sample, with the systematic variance:

$$\text{Explained variance} = 2.4372 - (1.129 - 0.7031)100\% / 2.437 = 82.5\%$$

Table 4 shows the results from the different models with regard to the overdispersion parameter, explained systematic variance, and explained total variance in per cent in addition to coefficients and standard errors for the different dimensions in each model separately.

Table 4: Negative binomial regression analyses of self-assessment of driving ability, safety attitudes, risk behaviour and months with a licence - explained variance in crash involvement

	Overdispersion parameter	B	Std. Error	Explained part of systematic variance (per cent)	Explained total variance (per cent)
Self-assessment of driving ability and Months with a licence	0.8616			82.5	64
General driving ability		-0.226*	0.0993		
Safety orientation		0.761***	0.1040		
The body dimension		-0.376***	0.0875		
Specific task skills		-0.013	0.0566		
Months with a licence		0.038***	0.0048		
Safety attitudes and Months with a licence	0.9633			80.0	62.4
Attitude towards rule violations and speeding		-0.297***	0.0658		
Attitude towards the careless driving of others		0.058	0.0473		
Attitude towards drinking and driving		-0.188**	0.0639		
Months with a licence		0.036***	0.0046		
Risk behaviour and Months with a licence	0.9581			80.7	62.5
Violation behaviour		-0.240***	0.0630		
Mistakes		-0.237*	0.0993		
Inattention		0.030	0.1005		
Inexperience		0.140	0.0858		
Months with a licence		0.034***	0.0047		

* = $p < .05$, ** = $p < .01$, *** = $p < .001$

Dependent variable: Crash involvement (numbers of accidents)

As can be seen in Table 4, the self-assessment model explains more variance (82.5%) than the safety attitudes model (80%) and the risk behaviour model do (80.7%). However, for all the models this is a high percentage of explained variance, indicating that they to some extent must be correlated with each other. *Months with a licence* is an exposure measure and is the most important contributor to the variance in all the models. The table shows that in the self-assessment model *Safety orientation* and *The body dimension* are the most important contributors to the variance. In self-reported driving behaviour *Violation behaviour* is the most important contributor and within the safety attitudes model *Attitude towards rule violations and speeding* is the most important one.

In addition an analysis showing all the models together were entered into a new model in order to test the relative importance of the different dimensions of self-assessment, safety attitudes and risk behaviour respectively, and controlled for months with a licence. The results from this analysis showed that *safety orientation* and *the body dimension* from the self-assessment model as well as *months with a licence* contributed significantly to the variance in crash involvement ($P < 0.001$). Also the dimension *Violations* from the risk behaviour model contributed significantly ($P < 0.01$). However, none of the variables in the safety attitudes model remained significant.

4. Discussion

4.1 Associations between driving experience and driver training on the one hand and self-assessment of driving ability, safety attitudes and risk behaviour on the other hand.

The results of the present study showed that there were small, yet significant, associations between driver training on the one hand, and traffic safety attitudes and risky driving behaviour on the other hand. As expected, driver training seemed to be most related to the respondents' evaluation of their driving skills. Furthermore, the results showed that attitudes as well as self-assessment of driving ability were significantly associated with self-reported risk behaviour. This was especially true for attitudes related to rule violations. There was a strong association between crash involvement and exposure measured as months holding a licence. Formal training was significantly negatively associated with the respondents' judgment of their own driving ability. Formal training was also significantly positively associated with safety attitudes. Further, the opposite was true for informal training with a lay instructor and for driving experience.

Self-assessment of driving ability

A possible explanation for the negative self-evaluation amongst those who reported high amounts of formal training may be that the training focused on the problem of overconfidence, in accordance with the learning objectives present in the GDE-model (Peräaho et al. 2003) and the driver training curriculum (Norwegian Public Roads Administration 2004). An objective is to enhance the learners' critical view of their own driving skills. Training focusing on the problem of overconfidence may lead learners to become more critical of their own skills as a driver. Thus, the results indicate that the training contributes to fulfilling this objective. Another explanation for

the differences in self-evaluations may be that the weakest candidates need more formal training compared to candidates mastering the training situation and the educational process better, and that this fact will be reflected in their self-assessment. If so, the respondents' self-evaluations may reflect their driving aptitude. However, as described in section 2.1 there were no significant associations into amount of lay instruction and professional driver training neither from educational level nor grades in comprehensive school. It is also possible that there may be external causes for which type of training the single respondent selects. Young drivers who have access to a car and a lay instructor may tend to choose informal training in order to reduce costs, while those with limited access to such a way of learning to drive would tend to seek formal training. This may also contribute to the need for a larger number of training lessons. In addition, there may be a geographical dimension; namely, in rural areas informal training may be easier to perform compared to urban areas, which also was indicated by the analyses referred to in section 2.1. Thus, type of training may be partly a result of circumstances which are not related to the learner's driving aptitude.

A possible explanation for an increase in positive self-evaluations amongst those who receive informal driver training may be that they gain more driving experience throughout their learning period compared to those who to a greater extent have to rely on formal training. Another possibility could be that it is primarily formal training that causes more negative self-evaluations and that informal training does not have the same effect. These results support the hypothesis derived from the skill model (Dreyfus & Dreyfus, 1986). The level of self-assessed driving skills seems to be positively associated with the amount of driver training and driving experience.

Safety attitudes and risk behaviour

It is interesting to note that formal driver training is positively associated with safety attitudes. In this respect, the learning objectives within the GDE-model – in Norway implemented in the driver training curriculum – are fulfilled. The results of the present study have also shown that the more formal driver training the respondents reported to have received, the less frequently they reported violation behaviour. However, the results of the present study have shown that high amounts of lay instructor training and driving experience are positively associated with 'non-ideal' attitudes and risky driving behaviour. This was especially true in relation to the dimension *violations*. These findings support to a great extent the expectations deduced from the skill acquisition model (Dreyfus & Dreyfus, 1986) presented in the introduction section, and is in

accordance with Lajunen and Summala (1995), who found that driving experience was correlated with less safety and rule-oriented driving. The findings are also consistent with Forsyth et al. (1995), who found an increase in the number of speed violations during the first three years after drivers were awarded their licence, and also consistent with findings by Sagberg and Bjørnskau (2003), showing that the extent to which respondents reported frequently violating traffic regulations increased with their driving experience.

However, the associations in the present study were significant though fairly weak, indicating that other aspects are more important predictors of attitudes and risk behaviour than practical driver training. It should be taken into consideration that the content of the driver's licence training is practical education focusing on driver skills. It is not aimed at influencing general attitudes towards traffic safety. Consequently, the associations should not be very strong. However, it is interesting that the focus on safety attitudes seems to be retained throughout formal practical driver training, while lay instruction contributes to non-ideal attitudes just as driving experience does.

There can be little doubt that traffic rules are context-free rules. It is known that novice drivers' behaviour in traffic to a greater extent is rule based compared to that of other drivers. The more driving experience a young driver has obtained, the more will the rules be related to the context in which the driving takes place. This may influence how drivers evaluate the value of the traffic rules. They gain insight into the role of the context in relation to the rules. This can lead to that they do not follow the rules strictly because it is not functional or seems to be less important in some situations. Consequently, their attitudes towards rule violations and speeding will become more flexible and 'non-ideal', with consequences also for their behaviour.

4.2 Dimensions in self-assessment of driving ability and safety attitudes associated with variance in risk behaviour

The four dimensions within self-reported driver behaviour are only partly explained through self-assessment of driving ability and safety attitudes. The best explained dimension is violation, $R^2 = .38$. It is safety attitudes which explain the main part of this variance (see Figure 3). This is in line with earlier findings showing a strong association between attitudes and behaviour (Ajzen & Fishbein, 1977; 2005; Ajzen, 1991; Kraus, 1995; Ulleberg & Rundmo 2002). Self-assessment of driving ability seems less important for explained variance in violation driving behaviour.

However, the body dimension and the specific task skills dimension together explain more than a half the explained variance in the behaviour dimension entitled 'inexperience'. The significant associations may indicate that the dimension inexperience is a valid dimension given that perceiving the car as a part of the body and skills to perform advanced manoeuvres; depends on driving experience. However, the associations are not strong, indicating that interpretations should be done with caution.

4.3 The association with crash involvement

As mentioned in the introduction a presupposition for using safety attitudes, self-assessment of driving ability and risk behaviour as safety relevant outcome variables for driver training as substitutes for accidents, is that they are closely related to crash involvement.

It is interesting to note that self-assessment as well as safety attitudes and self-reported driving behaviour separately explained more than 80% of the variance in crash involvement when it was controlled for how long time the respondents had held the licence. However, in the last negative binomial regression analysis in which all the models were entered as predictors, self-assessment of driving ability with particularly the *safety orientation* and *the body dimension* seemed to be the most important dimensions in addition to time holding the licence. The self-assessment instrument relates more to driving skills, while the others relates to safety attitudes and more or less directly related self-reported behaviour, indicating that skills may be more important element in young drivers' crash involvement than attitudes and self-reported driving behaviour. However, in the present study, serious accidents as well as less serious accidents and car crashes with only material damage were included. More than one-third of the subjects reported involvement in one or more crash. There is reason to believe that many of these are minor accidents and car crashes with small material damage. It could be that minor accidents primarily were caused by lack of driving skills while the more serious accidents happened due to rule violations in the form of speeding and drunk driving, in accordance with the results from in-depth analyses of young drivers' accidents (Clarke et al., 2002; Moe, 1999). However, the data in the present study do not allow for conclusions to be drawn in this respect.

Another possible explanation for finding the self-assessment model to be the model strongest associated with crash involvement may also be that this instrument to some

degree invites the respondents to relate their response to the driving context, which may lead to a more corresponding level of specificity with crash involvement, see for example Ajzen and Fishbein (1977) who assume that attitudes and behaviour are highly correlated when measured at corresponding levels of specificity. The safety orientation aspect of self-assessed driving ability seems to be important for safety, and is positively associated with driving experience. The situation may very well be that driving experience helps young drivers to develop accurate judgments of dangers and risk elements in traffic independent of traffic rules, and that these abilities are more important for safety rather than safety attitudes measured as law-abidingness.

4.4 Consequences for driver training

The present study has shown that high amounts of lay instructor training and driving experience are associated with 'non-ideal' attitudes and risky driving behaviour. Although lay instruction (Gregersen et al., 2000; Sagberg, 2000) as well as driving experience (Sagberg, 2000; Mayhew et al., 2003), has been shown to contribute to reduced risk, the negative correlation with safety attitudes and behaviour indicate possible safety benefits if these safety relevant variables could be improved by other educational measures.

In this respect it is interesting to note that the results showed professional driver training associated with enhanced safety attitudes and less frequent self-reported risk behaviour. The conclusion is that professional and informal practical driver training may supplement each other, and that both formal and informal training are beneficial, albeit in different ways. The present study identifies some of the differences with regard to important safety relevant variables, stated as important objectives in the driver training curriculum.

It seems that the safety utility of informal driver training as well as driving experience hardly can be attributed to changes in safety attitudes and behaviour. However, the level of self-assessment of driving ability grows along with the increase in lay instruction and driving experience. The fact that self-assessment of driving ability increased with driving experience, and parallel to a reduction in accident involvement, indicate that safety relevant skills are reflected in the conception of self-assessment of driving ability. Hence, the strong risk reduction may at least partly be attributed to developing driving skills. Also Lajunen and Summala (1995) found driving skills correlated with driving experience based on a study in which driving skills were

measured in terms of self-assessment of driving skills. A tentative conclusion is that the present study support previous research regarding informal driver training as a valuable source for developing safety skills.

According to Clarke et al. (2002) and Laapotti et al. (2001), safety attitudes are important as an explanation at least for the most serious of young drivers' accidents. The present study shows safety attitudes to be the most important determinant of variance in risk behaviour. Hence, the results indicate that there is a need for goal-directed driver education to influence attitudes. Lay instruction is not goal directed in this respect. Lay instruction and driving experience are a way to improve driving skills rather than a way to strengthening safety attitudes. Goal-directed formal driver training may influence safety attitudes (towards rule violations) more effectively. This may be the explanation of the positive association between amount of formal driver training and the strength in safety attitudes. However, it is important to influence safety attitudes in a way that makes them less vulnerable to a possible negative attitudinal effect of driving experience. In accordance with the skill model (Dreyfus & Dreyfus, 1986; Wackerhausen, 1997), it may be crucial how the importance of the traffic rules is taught. If they are taught with reference to individual risk they will soon lose their actual guiding value for acting in traffic. This is because the young driver learns that minor exceeding of, for example, speed limits will not be dangerous in itself; rather, it will depend on the situation. Risk associated with small and relatively common violations of the traffic rules is hardly apparent at an individual level. What young learners are taught as risky has to be visible as an outcome at the individual level, i.e. risks causing serious accidents, such as serious speeding offences, driving when impaired and possibly also combined with not wearing seatbelts.

Following the regulations in traffic is important to improve the overall safety margins which will result in reduced accident costs to society, due to reduced numbers of killed and injured. However, due to the features of the accident variable, including the high degree of randomness, it will be impossible to address the gain to specific individuals in advance. Driver education with the goal of influencing attitudes, and making learner drivers less vulnerable to the negative influences of driving experience, should emphasise the ethical aspect of the rules. It is necessary to make it clear that the objective behind learning the rules is not to test whether or not they are needed for individual safety purposes. Rather, traffic rules are mainly needed in order to ensure general safety margins in traffic, beneficial for the society and for individual road users

who we never can identify in forehand as accident victims resulting from too low safety margins. Thus, every driver is responsible for the safety of others as well as for themselves.

The conclusion is that formal and informal driver educations seem to complement each other. Formal as well as informal driver training are important, due to the fact that they are differently associated with output variables important for traffic safety.

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Paper III

Differences between formal and informal practical driver training as experienced by the learners themselves

Torbjørn Tronsmoen

Department of Psychology
Norwegian University of Science and Technology,
N-7491 Trondheim, Norway

Norwegian Public Roads Administration
Directorate of Public Roads, P.O. Box 8142 Dep.,
NO-0033 Oslo, Norway

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Torbjørn Tronsmoen

*Department of Psychology, Norwegian University of Science and Technology,
N-7491 Trondheim, Norway*

*Norwegian Public Roads Administration, Directorate of Public Roads,
P.O. Box 8142 Dep., NO-0033 Oslo, Norway*

Abstract

The safety effect of driver training is widely discussed in the research literature. The paper focuses on practical driver training before licensing for drivers of passenger cars. The amount and content of lay instructor and professional driver training as perceived and reported by the learners themselves are examined and compared. This includes how various educational elements are emphasised. It is also examined how these differences contribute to variance in safety-relevant variables as self-assessment of driving skills, safety attitudes and risk behaviour. The results are based on a self-completion questionnaire survey conducted among a randomly drawn sample of Norwegian drivers aged 18–20 years ($n = 1419$). The respondents perceived professional instructors to place different emphasis on educational elements compared to lay instructors. Another finding was that the examined didactic properties of the practical driver training are associated mainly with developing driving skills (measured as self-assessed skills) rather than safety attitudes and risk behaviour. The study indicates that lay instruction depends on a ‘safety margin strategy’, resulting in avoidance of the most challenging aspects of training. Regression analyses showed that the educational aspects of greatest importance to self-assessed skills were the learner characteristics and the amount of lay instruction, as well as the lay instructors’ emphasis of the educational elements, clarity in communication about risk and formative evaluations as perceived by the learners. The conclusion is that the two forms of instruction should complement each other. In particular, the more demanding aspects of driving must be dealt with through professional driver training while a high amount of informal accompanied driving contributes significant to development of driving skills measured as self-assessment of driving skills.

Keywords: Formal and informal driver training, Lay instruction, Didactic categories, Young drivers, Driver training content

1. Introduction

The road safety effect of driver training is widely discussed in the research literature. Based on different reviews and meta-analyses, it is by no means clear whether professionally trained drivers are safer drivers than those who learned to drive in other ways (Christie, 2001; Engström, Gregersen, Hernetkoski, Keskinen, & Nyberg, 2003; Elvik, Mysen, & Vaa, 1997; Elvik & Vaa, 2004). The OECD (2006) concludes that formal pre-licence driver training has not been consistently effective as a safety measure.

For young drivers there is a sharp decline in the risk of being involved in a crash during the first months after licensing. Sagberg (1998, 2000) found a reduction in crash involvement of 50% in the first 8 months. Similar results are known from Sweden (Gregersen et al., 2000), Canada (Mayhew, Simpson, & Pak, 2003), and Germany (OECD, 2006). Age as well as driving experience has been shown to play a role in this decline. Comparison along different studies has shown age factors to account for 30–50% of accident reduction while experience factors account for 50–70%. The experience factor is increasingly important when the minimum licensing age is higher (18 years), as in the Nordic countries (Engström et al., 2003).

Thus, driving experience seems to contribute considerably to decreased risk. The present paper focuses on two forms of practical driver training before licensing for drivers of passenger cars: formal driver training means lessons provided by a professional driving school, while informal driver training is taken with lay instructors, such as parents or other family members or friends. Informal driver training is of current interest due to the importance of driving experience as a risk-decreasing factor among novice drivers.

Increased amounts of supervised practice under safe conditions before licensing may reduce the risk of crash involvement after licensing. Forsyth (1992) showed that learners who had some driving experience besides the professional instruction were more likely to pass their driving test. Bjørnskau (2003) found candidates who received many professional lessons to have less informal driving practice and to be more likely to fail their driving test.

More supervised driving with lay instructors has been shown to reduce crash involvement among young drivers once licensed. A Swedish study (Gregersen et al.,

2000) showed that after a reform including a reduction of the age limit for accompanied driving (from 17.5 to 16 years) there was a general reduction in the accident risk (accidents per 10 million km) among novice drivers of approximately 15%. However, the resulting difference in accident risk for those who utilised the lower age limit was approximately 40% compared to the situation before the reform and 24% compared to those who did not choose to utilise the possibility to practice from 16. These effects include adjusted effects of confounding factors such as socio-economic status. However, Sagberg (2000) did not find any effects on safety after a reduction in age limits for supervised driving in Norway, probably due to a lack of increase in such driving. Gregersen and Nyberg (2002) reported a mean practice level of 112 h private training during a 2-year period from starting to practice at 16, and Sagberg and Gregersen (2005) reported a driven distance of 3795 km in Sweden compared to 1153 km lay accompanied driving in Norway. In Norway it was only a modest increase from 974 km which was the situation before the reduction of the age limits. Sagberg (2000) found an average of 54 driven tours. A mean duration of a tour somewhat lower than one hour indicated less than 54 h behind the wheel in lay driver training.

In order to enhance the amount of accompanied driving The Norwegian Public Roads administration has organised information meetings for parents and learners nationwide about the importance of learner driving. Ulleberg (2003) found an increase in lay instruction, and based on his data he estimated an average of about 2000 km lay accompanied driving before licensing.

In Norway, most learner drivers undergo both formal and informal practical driver training. Educational content and aspects of driver training that are considered important have been defined in national curriculum systems and in the national licensing system, with descriptions of criteria for evaluation through the driving test. The content also reflects what kinds of accidents young drivers are especially prone to. Educational elements that cannot be tested adequately in the licensing test are addressed through mandatory lessons. These lessons include elements of theory and driving practice as well as practical evaluation lessons taken throughout the learning process. Thus, professional driving schools provide mandatory as well as optional programmes (Norwegian Public Roads Administration, 2004a). Learner drivers are free to obtain additional driver training with a lay instructor in an ordinary family car, provided the instructor has continually held a licence for a minimum of 5 years. Learners usually reduce their costs by supplementing the minimum of mandatory professional training

with accompanied training to gain sufficient driving experience before taking their driving test. Thus, most drivers in Norway will have experienced both lay and professional instruction as learners. However, the mix between the two types of driver training and the amount of accompanied driving with a lay person may differ from person to person for practical and other reasons. However, the fact that learner drivers experience both professional and lay instruction makes it possible to compare formal and informal driver training based on the experiences the individual learner has with the two types of driver training.

In Norway, the average amount of formal practical driver training; i.e. professional lessons are shown to be at approximately 10 lessons a 45 min during the period from starting driver training and until licensing. This amount is in addition to the mandatory training. This amount is shown to be stable over time (Norwegian Public Roads Administration, 2002, 2003, 2004b).

1.1 Appropriate self-assessment, safety attitudes and safe behaviour as outcome variables in practical driver training

As the one-to-one situation involves a very close instructor–learner relation, training behind the wheel provides possibilities to ensure the quality of the communication between the learner and the accompanying person. Using both professional instructors and lay accompanying persons provides feedback from more or less authoritative drivers, in addition to experiencing specific traffic situations and courses of events that arise as a result of driving behaviour. This may provide a basis for further transfer of knowledge from other areas of driving competence in addition to those related to driving skills. It is likely that relevant aspects of attitudes and motives as well as a critical perspective on the learner's driving ability will be included. This may make it possible to mediate crucial knowledge about important choices when driving and to motivate the learner for safe driving. In addition, the driving situation may provide practical experience of to what extent certain attitudes and behaviours are safety-effective. Consequently, safety attitudes (i.e. attitudes towards traffic safety issues) and risk behaviour (i.e. involvement in risk-related activity in traffic) as well as self-assessment of driving skills may improve with practical driver training.

Tronsmoen (2010) compared formal and informal practical driver training in Norway with regard to the associations with these outcome variables. Formal practical driver training was found to be positively associated with safety attitudes. The more formal

driver education respondents received, the less frequently they reported violations. However, the study indicated that high levels of lay-instructor training and additional driving experience were associated with non-ideal attitudes and risky driving. Learners with the highest numbers of professional lessons were the most self-critical about their driving ability, while high amount of lay instruction was associated with high scores in self-assessment (Tronsmoen, 2010).

These findings regarding associations between supervised practice and attitudes were in contrast to findings by Gregersen and Nyberg (2002). In an evaluation of the 16-years limit for supervised practice in Sweden they showed that the new system with higher amount of accompanied driving over an extended training period influenced neither safety attitudes nor self-assessment in a negative way. Results from Sagberg and Gregersen (2005) indicated that accompanied driving was more effective in reducing the subsequent crash risk than driving alone.

However, little is known regarding how educational qualities connected to the practical training are associated with the outcome variables, i.e. the working mechanisms in the training are still unidentified. Consequently, it is interesting to examine whether associations between the two forms of training and attitudes, behaviour and self-assessment also are connected to the content and emphasis of different educational elements as well as whether it depends on other didactic characteristics in the training. Identifying possible qualities in the training that are associated with such safety relevant outcomes is necessary in order to achieve educational goals, see for example Rismark and Sølvsberg (2007), Lonero (2008) and Gandolfi (2009).

1.2 Analysing possible working mechanisms in practical driver training

Teaching is a complex process involving different and related phenomena expected to influence the learning process and the value of the training (Strand & Kvernbekk, 2000). Didactic variables such as the amount of instruction, learner characteristics and preconditions such as aptitude, former experience and motivation, the teacher's competence, frame factors such as the amount of training and education, the content of the training, teaching methods, evaluation during the learning process, and the quality of the communication may all be important for goal achievement within driver training (Elvik et al., 1997; Lyngsnes & Rismark, 2007). These aspects of learning and teaching are important in planning, analysing and evaluating instruction, and are included in

didactic models in accordance with Bjørndal and Lieberg (1978), Hiim and Hippe (1989a) and Lyngsnes and Rismark (2007).

Hiim and Hippe (1989a) assume that most of the important aspects within educational processes are covered by the following didactic categories: *Learner characteristics*: elements such as previous knowledge, motivation, learning aptitude, motor skills, self-efficacy and gender. *Frame factors*: conditions making learning possible or even representing limitations for learning. Examples of frame factors include time set aside for teaching and learning, equipment, teaching aids, the teacher's competence. *Goals*: Educational goals refer to what the learner shall acquire in terms of skills, knowledge, attitudes and repertoire for action during the training. Goals at an operational level are closely related to the content of the education as well as the learners' characteristics. An operational goal, for example, may be to master specific skills described as educational content in the syllabus. *Content*: Subject matter refers to the themes the tuition deals with. The content should be organised and adjusted to suit the learner's characteristics. *The learning process*: This covers matters such as methods, instruction, communication and atmosphere between the instructor and learner, and how to motivate. *Evaluation*: Includes both the instructor's and the learner's evaluation during the learning process (formative evaluation) and the evaluation of the learner at the end of the training period. In driver training, this evaluation is represented as a measurement of whether the learner is qualified to be licensed (summative evaluation). Formative evaluation is closely connected to the learning process due to the importance of evaluative considerations with regard to decisions about method and progress. Moreover, these didactic categories are assumed as closely interrelated, i.e. they are continually and mutually influencing each other within learning and teaching processes (Bjørndal & Lieberg, 1978; Hiim & Hippe, 1989a). In Norway, the Norwegian Public Roads Administration conducts supervision and guidance of the authorised driving schools, emphasising that the planning and analysis of the instruction should take into account aspects related to the most important didactic categories as described in Hiim and Hippe (1989a) (Stene & Fjerdingen, 2003; Tronsmoen, 2003).

However, former research within driver training has only partly examined the relation between didactic variables and the outcome of the education and training provided (Elvik et al., 1997). Accordingly, it is an aim of the present study to examine the relationship between the outcome of driver training and didactic characteristics of the training.

Little is known about what kind of instruction parents provide and how they go about supervising their teenagers in traffic. Only a few studies have directly compared differences between lay instruction and professional driver training with regard to how the training is conducted when driving on the road. Gregersen and Nyberg (2002) found that important aspects in lay instruction in Sweden were speed adjustment, scanning the surroundings, training in manoeuvring skills, risk perception and evaluation, driving at crossroads, and the learners' self-assessment of their own lack of ability. Groeger and Brady (2004) found that professionals compared to lay instructors gave more instruction and differed from accompanying persons by providing more comments directed towards different aspects of teaching (for example car control, observation, appreciation of danger, traffic law and custom). They also found differences in the type of driving typically encountered. For example, professionals provided limited instruction during darkness compared to lay instructors. Their study also confirmed that pupils' driving ability improved as a power function of the amount of instruction they received. That is, the largest benefits from time spent behind the wheel come relatively early; with a gradual reduction in the benefits of practice as learning proceeds (see also Groeger, 2000). There was also a tendency for less able learners to gravitate towards more professional instruction.

To understand how formal and informal practical training may complement each other, it is important to clarify how the learners experience the content and features of informal supervised practice and the ways in which it differs from professional driver training. This study aims to examine and compare the content of lay instructor and professional driver training as perceived and reported by the learners themselves. Such knowledge may contribute to the improvement and efficiency of both types of training and lead to a better understanding of how lay instruction and professional instruction may supplement each other.

The present article seeks to provide more knowledge about how lay instruction is usually carried out (as perceived by the learners themselves) and how it differs from professional driver training with regard to meeting the requirements in the curriculum. An additional aim is to examine how the differences are associated with variance in such important safety-relevant variables as self-assessment of driving ability, safety attitudes and risk behaviour. Consequently, an additional aim is to examine the relationship between educational content and emphasis of the content in the instruction, as well as other didactic categories on the one hand; and self-assessment, attitudes and

behaviour on the other hand. The basis for this examination is the objective of identifying working mechanisms in practical driver training. The comparison between the two types of driver training may provide useful knowledge for the structuring of supervised driving and driver training as a whole.

1.3 Aims

The core aims are (1) to examine and compare the amount and content of lay instructor and professional driver training, and (2) to examine the relation between self-assessed driving skills, safety attitudes and risk behaviour on the one hand and driver training on the other hand, specified by the following predictor variables based on didactic categories:

- *Learner characteristics* operationalised by including gender, level of education, former experience with driving other vehicles (such as motorcycles), and motivation with regard to driving skills in the analyses.
- *Frame factors* for learning: The analyses in the present study include the amount of instruction given through lay instruction and professional driver training. Former research has shown a safety effect related to a high amount of experience gained through accompanied driving (Gregersen et al., 2000).
- *Goals and content*: Goals at an operational level are closely connected to the content of the education and training. The present study includes the learners' perception of how instructors and other accompanying persons emphasise various educational elements described in the curriculum in addition to emphasis and communication regarding the issue of risk.
- *The learning process* including the atmosphere in the car as well as *formative evaluation*.

The associations will be controlled for driving experience gained after licensing.

2. Method

2.1 Sample

The respondents in the present study were a sample of the Norwegian population's young drivers aged 18–20 years. Four thousand persons were randomly selected from the official driver licence registry AUTOSYS. It should be noted that all the respondents had obtained a full licence for passenger cars. The minimum age for

holding a driver's licence in Norway is 18 years. The drivers responded to a mailed questionnaire. The data were collected during autumn 2005 and spring 2006; a total of 1419 respondents replied to the questionnaire. One hundred and sixty seven questionnaires were returned due to unknown addresses. The response rate was 37%. Analyses showed that the distribution of respondents closely mirrored patterns in the population. The respondents consisted of 49% men and 51% women (according to Statistics Norway the actual distribution is 50.4% and 49.6%). 13% of the respondents were from the four largest cities in the country; according to available licensing statistics from the Norwegian Public Roads Administration this reflects the actual distribution of 18-year-olds licensed in 2005 (13.4% in the four largest cities). Note that the largest cities are underrepresented in the licensed population compared to the population as a whole, partly due to better access to public transport in urban areas. Accordingly, the distribution in the licensed population and in the present sample is fairly similar, indicating that the sample is representative.

2.2 Questionnaire

The amount of formal training was measured by asking how many practical driving lessons (other than mandatory lessons) they went through since they started by the driving school and until licensing. In Norway a driving school lesson lasts 45 min. Informal driver training was also measured by self-report by asking how many times they had driven with a lay instructor through their learning period. To help them estimating this it was given some examples: '3 times a week in two years will give approximately 300 shifts, and two times a week in one year will give approximately 100 shifts'. The respondents were asked to report a reasonable estimate with regard to numbers of shifts. In addition they estimated an average length of a shift, giving the basis to estimate the amount of time applied for accompanied driving.

The questionnaire measured several aspects of formal and informal practical driver training. The respondents were asked to compare how different aspects of content were emphasised in their driver training. They also rated items related to educational methods and didactic issues. The content of the practical driver training was mapped using 25 descriptive items covering different elements in driver training. Two open questions were added, providing the possibility for respondents to address further aspects focused by the lay instructor and the professional driver trainer, respectively. Measurement was based on the experience of the individual respondent with professional instructors and with lay instructors. Respondents were asked to compare,

in their experience, how professionals and lay instructors emphasised different educational elements. The items were developed based on common educational elements in the Norwegian driver training curriculum (Norwegian Public Roads Administration, 2004a). Relative emphasis of the educational elements was given on a 5-point scale ranging from (1) 'Not mentioned at all' to (5) 'Strongly emphasised'.

To compare differences in aspects of the communication process in the car, the questionnaire described two ordinary driving situations, one situation driving a bit too fast on a bendy road approaching a sharp curve, and one situation approaching a complex and partly blind junction. The respondents were asked to assess in parallel how the lay instructor and the professional would respond in the given situations with regard to timing and clarity. The response was given on a 10-point scale ranging from (1) *Would speak out immediately* to (10) *Would wait until the situation was passed by*. Regarding clarity the options was from (1) *Would speak out clearly and crisply*; to (10) *Would say nothing*. The respondents were also asked whether they thought that they could anticipate the instructors' possible unspoken assessment of driving too fast in the described situations. Also here the response was given on a 10-point scale ranging from (1) *Would strongly dislike* to (10) *Would not care*. It is worth noting that these questions are intended to indicate the respondents' perception of the instructors' limits for acceptance of reckless behaviour. The respondents' perception of the type of driving behaviour the instructor can accept was considered to be of possible importance for learning. However, such perception does not necessarily depend on specific experiences from the situations described; it might also be the result of a more general knowledge of the instructors' view and attitudes.

The questionnaire also contained measurement instruments regarding safety attitudes, self-assessment of driving ability and risk behaviour, respectively. An 18-indicator Norwegian measurement instrument was used to measure attitudes towards traffic safety (Iversen, 2004; Iversen & Rundmo, 2004). The indicators covered the following three dimensions: (1) *attitudes towards rule violations and speeding*, including statements such as 'Many traffic rules must be ignored to ensure traffic flow' and 'Speed limits are exceeded because they are too restrictive', (2) *attitudes towards the careless driving of others*, including 'I will ride with someone who speeds if that is the only way to get home at night' and (3) *attitudes towards drinking and driving*, such as 'I would never drive after drinking alcohol' (Iversen & Rundmo, 2004). In order to measure self-reported driving behaviour, Åberg and Rimmö's, 1998 32-item instrument

was applied. This measurement instrument is based on a study by Reason, Manstead, Stradling, Baxter, and Campbell (1990), but expanded with items constructed to fit a Scandinavian context. Åberg and Rimmö (1998) showed that the indicators assess four dimensions. The first dimension, *violations*, included items such as 'Deliberately disregard speed limits' and 'Disregard speed limit to follow traffic'. The second dimension, *mistakes*, referred to dangerous errors and included for example 'Misjudgement of the gap when overtaking'. The third dimension from Reason et al. (1990), harmless lapses, was split into *inattention* errors and *inexperience* errors (Åberg & Rimmö, 1998). Inattention included items such as 'Misread signs, find yourself lost' and 'Fail to notice green arrow'. *Inexperience errors* included items such as 'Have to check gear with hand' and 'Shift into wrong gear when driving'. The measurement instrument used to examine self-assessed driving ability consisted of 31 indicators along four dimensions, further described in Tronsmoen (2008). The first dimension related to self-assessment of *general driving ability*, including skills such as driving fast, anticipating, driving in slippery conditions, and driving in the dark. The second dimension, *safety orientation*, refers to the driver's perception of his/her ability to identify risk or danger and of his/her ability to drive with satisfactory safety margins. The third dimension is the *body dimension*, which measured the feeling of unity with and control of the car. The fourth dimension was *specific task skills*; items in this dimension included judgement of the ability to parallel park precisely and efficiently, to reverse into a garage, and to reverse using the rear-view mirrors.

However, note that self-assessment of driving skills does not necessarily reflect actual skills; even though self-assessment may be used as an indicator of actual driving skills and the development of such skills (see for example Lajunen & Summala, 1995).

In addition, the questionnaire contained demographic variables such as sex, age and education. Degree of urbanisation in the living area during the period when driver training took place was also measured. Driving experience was measured by asking how many kilometres the subjects drove per month on average, and how long they had held a full licence.

2.3 Statistical analysis

Descriptive statistics were used to calculate means and standard deviations in the amount of driver training. A paired samples *t*-test was applied to compare means

between the respondents' rating of the professional instructor compared to the lay instructor, i.e. the means of matched pairs of variables for a single group.

Hierarchical regression analysis was conducted to examine the relationship between self-assessment, safety attitudes and driving behaviour on the one hand and the groups of predictor variables determined by the different didactic categories as described in Hiim and Hippe (1989a); see also Bjørndal and Lieberg (1978) and Lyngsnes and Rismark (2007) on the other hand. Theoretically the basic point of departure for every educational measure is learner characteristics. Hence, this was also chosen as the start of the block regression. In the next step the amount of the two types of driver training, the basic activity was entered into the model. The amount of training was considered as the most important frame factor. The other didactic categories were controlled for in this order: Goals and content, learning process and evaluation, and finally for driving experience after licensing.

Regression analyses were applied to identify predictors for the amount of the two forms of driver training. The independent variables were sex, degree of urbanisation in the living area during the period when driver training took place, age when lay instruction started, educational level and grades in lower secondary school in mathematics, languages and gymnastics.

Factor analyses were applied in order to assess the dimensionality in the three measurement instruments; self-assessment of driving ability, safety attitudes and self-reported driving behaviour, as reported in Tronsmoen (2008, 2010).

3. Results

3.1 Recruitment to formal and informal practical driver training

Two regression analyses were carried out with the amount of lay instruction and professional driver training respectively as dependent variables. These analyses showed no significant associations either for educational level or grades in lower secondary school. The exception is school performance in physical education, which is weakly (though significantly) negatively associated with the number of professional lessons. The time of the first lay instruction lesson, gender and level of urbanisation were important for the amount of lay instruction and number of professional driver training

lessons respectively. Learners living in rural areas have more lay instruction than those who live in urban areas. Men receive more lay instruction than women.

3.2 The amount of practical driver training

The entire sample, with exception of two of the respondents, received more professional practical driver training from driving schools than the mandatory driving lessons (Fig. 1). The mean value was 14.26 practical driving lessons attended at a driving school, while the median was 12 lessons; the SD is 9.47. Less than 17% had more than 20 practical lessons in driving school, and less than 1% had more than 40 lessons.

A total of 76% of the learners had their first driving practice before reaching the age of 17. More than 90% did not attend any professional practical driving lessons before starting accompanied driving with a lay instructor. Except three respondents (0.2%), they all had received private instruction of different amounts. The mean value of lay instruction was 114.8 h (after excluding outliers), while the median was 75 h, indicating that the distribution is skewed. The spread was considerable, with an SD of 119.04. Driven kilometres lay instruction was about 2300 km. The distribution in the amount of lay instruction is shown in Fig. 2.

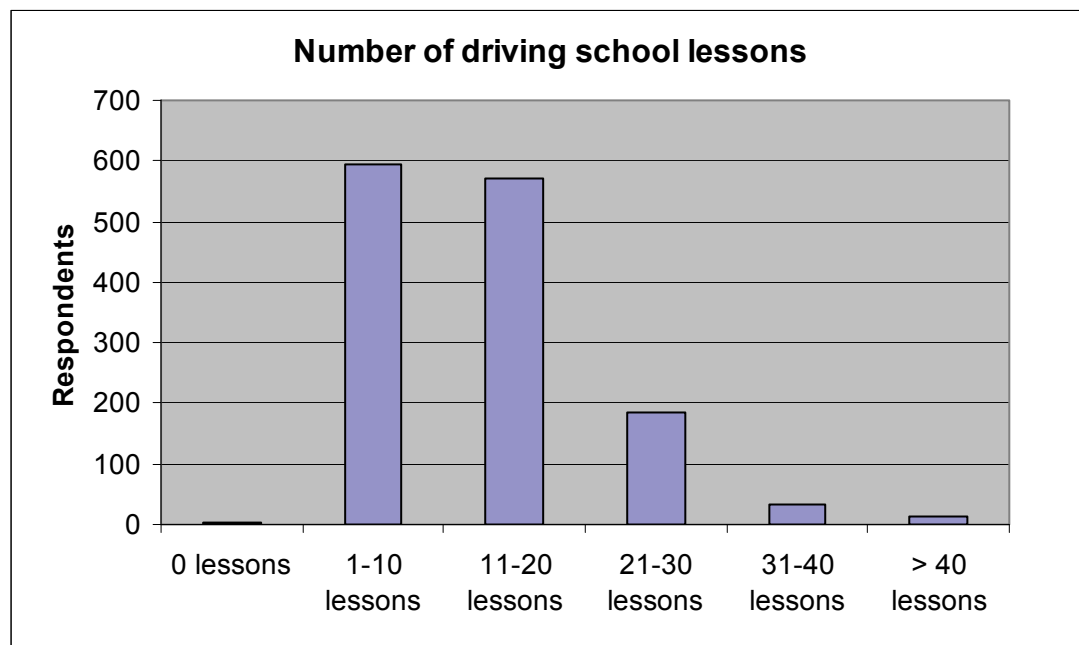


Figure 1: *The distribution of driving school lessons (professional instruction) among the respondents.*

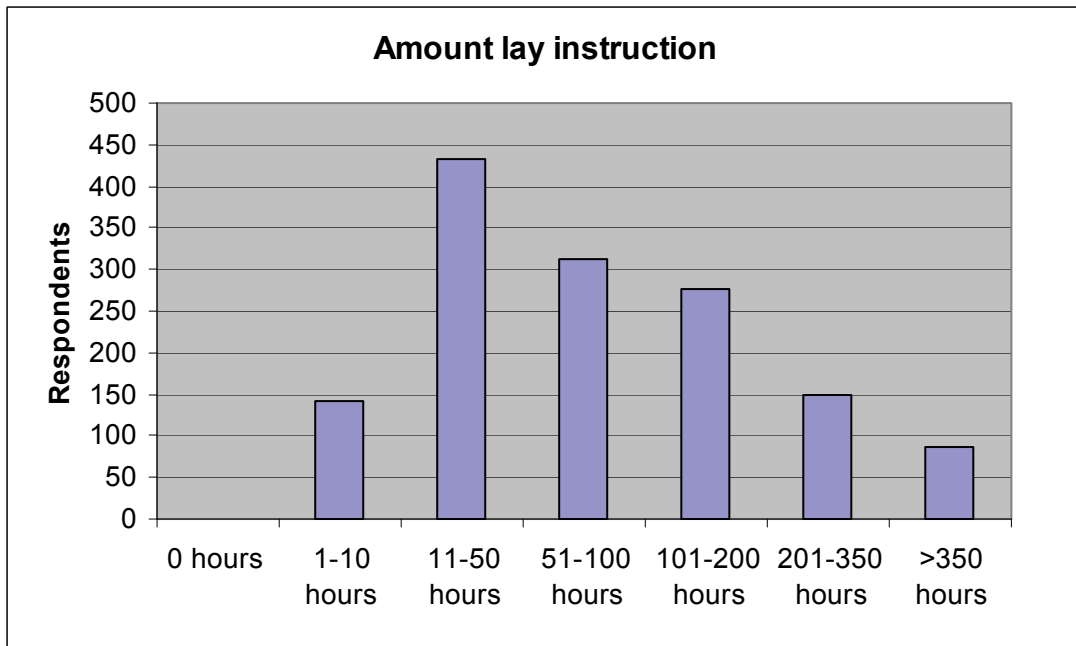


Figure 2: *The distribution of amount of lay instruction among the respondents.*

3.3 Emphasis on various educational elements in practical driver training

Table 1 shows the mean and standard deviations for the different items. In general, professional instructors were rated higher than lay instructors with regard to their emphasis on the different elements in the training. With two exceptions professional instructors placed greater emphasis to all aspects compared to lay instructors. The exceptions were “start-up and stopping” (in which lay instructors placed statistical significantly greater emphasis compared to professionals), and “importance of choices of what kind of person you want to be” (in which the differences were not statistically significant).

The greatest difference between professional and lay instructors occurred in their emphasis on overtaking, changing lanes, hazard detection, traffic rules, training in acceleration lanes, and the importance of predictable driving.

The ranking of the educational elements with reference to the score indicating how the respondents reported the emphasis in the instruction by the professionals and the

laymen was quite different for lay instructors compared to professional driving instructors (Figs. 3 and 4).

The most emphasised elements for lay instructors were speed adjustment, risk avoidance and distance to the car ahead (Fig. 3).

The three most emphasised elements in professional instruction were hazard detection, speed adjustment and traffic rules (Fig. 4). These are essential elements in both the syllabus and the driving test. Environmentally sound driving scored lowest among both professional and lay instructors.

Table 1 Instructors' emphasis on different educational elements in driver training

<i>Instruction element</i>	<i>Lay instructor</i>		<i>Professional instructor</i>		<i>All t</i>
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>	
Speed adjustment	4.18	.89	4.44	.77	-10,22**
Risk avoidance	3.90	1.06	4.22	.88	-13,27**
Safe distance to the car ahead	3.87	.98	4.06	.90	-7,27**
Traffic rules	3.81	1.00	4.40	.80	-23,55**
Start-up and stopping	3.79	1.08	3.66	1.12	4,01**
Crossroads	3.73	.99	4.19	.84	-17,96**
Hazard detection	3.71	1.01	4.48	.75	-27,14**
Allow for pedestrians and bicyclists	3.69	1.19	4.15	.98	-18,17**
Importance of predictable driving	3.66	1.05	4.29	.82	-23,07**
Keep driving style in accordance with skills	3.57	1.13	3.81	1.02	-9,12**
Risk when not belted	3.55	1.41	3.71	1.33	-5,81**
Self-awareness of lack of skills	3.53	1.17	3.62	1.09	-3,23*
Positioning when oncoming traffic	3.48	1.07	3.89	.98	-15,52**
Co-operation and interaction	3.42	1.08	3.93	.94	-18,32**
Impact of alcohol when driving	3.38	1.61	3.51	1.49	-4,03**
Manoeuvring skills	3.31	1.20	3.95	.92	-18,65**
Training in driving around bends	3.31	1.27	3.41	1.13	-3,03*
Seat, neck-rest and belt adjustment	3.20	1.13	3.83	1.05	-20,28**
Traffic lights	3.04	1.26	3.85	1.70	-17,00**
Changing lanes	3.01	1.22	3.90	1.02	-28,66**
Importance of choices of what kind of person you want to be	2.83	1.40	2.87	1.34	-1,07
Overtaking	2.77	1.26	3.99	.92	-35,42**
Training in acceleration lane	2.75	1.26	3.58	1.19	-23,59**
Risks when driving with young passengers	2.73	1.38	2.87	1.38	-4,76**
Environmentally sound driving	2.47	1.26	2.60	1.21	-4,20**

Ratings from 1 'Not mentioned' to 5 'Strongly emphasised'

** = $p < .001$, * = $p < .01$

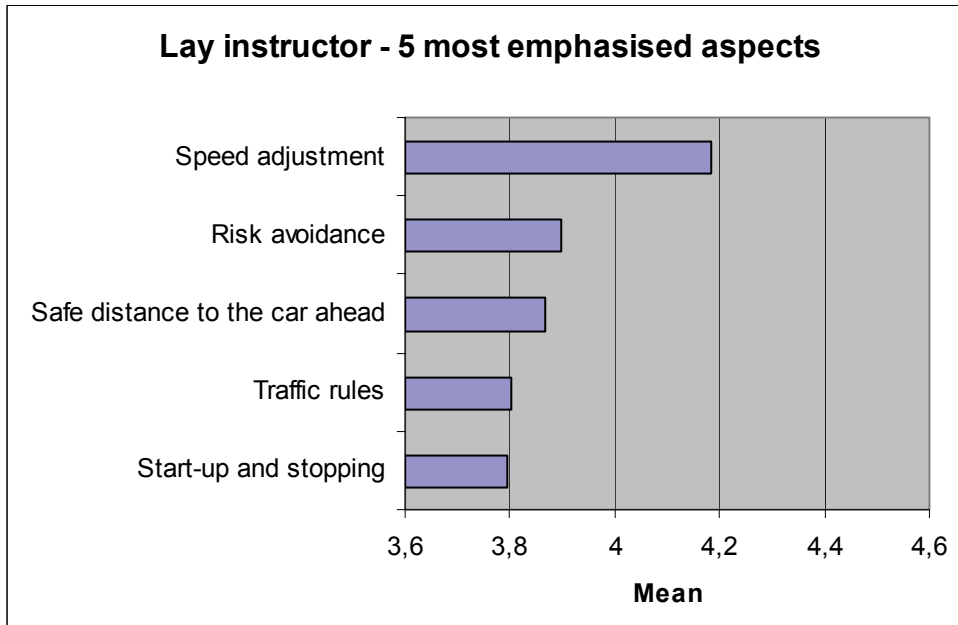


Figure 3: *The most important aspects in lay instruction.*

Ratings from 1 'Not mentioned' to 5 'Strongly emphasised'

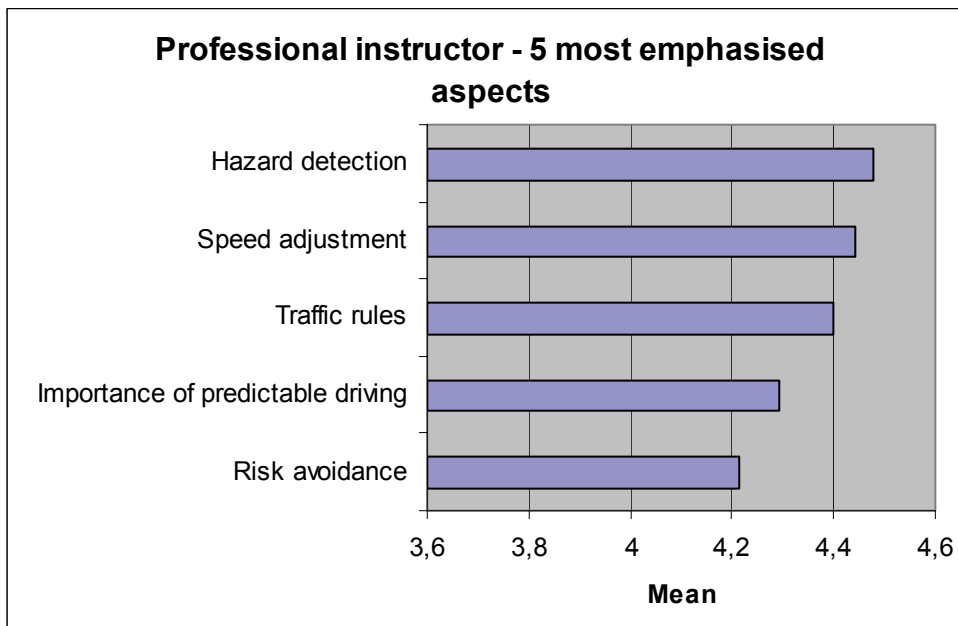


Figure 4: *The most important aspects in professional instruction.*

Ratings from 1 'Not mentioned' to 5 'Strongly emphasised'

3.4 Dimensionality and psychometric quality of self-assessment, safety attitudes and risk behaviour

The dimensionality of the measurement instruments were identical with the former experience with these measures, see Iversen and Rundmo (2004), Åberg and Rimmö (1998) and Tronsmoen (2008), respectively.

Cronbach's (1951) alpha coefficient was applied to evaluate the homogeneity of the items within the different dimensions of the three measures. Cronbach's alpha was $>.7$ and item-total correlations were all high, indicating good internal consistency and reliability. For further information regarding the measurement instruments applied in the current sample, see Tronsmoen (2008, 2010).

3.5 Predictors of variance in outcome variables of practical driver training (hierarchical block regression)

In the initial analyses each of the dimensions in safety attitudes, self-reported behaviour and self-assessment of driving ability were analysed as the dependent variable in regression analysis, with variables related to the didactic categories in the training entered as independent variables. However, the associations were rather weak, with explained variance between 2% and 5% (R^2) for most of the outcome variables. The only dimension which remained with an acceptable explained variance was the dimension *Specific task skills*, a part of self-assessment of driving ability. Consequently, this dimension was analysed further using block regression analyses.

Table 2 shows the results of the block regression. In total the predictors explain 31% of the variance in self-assessment of specific task skills (adj. $R^2 = .31$).

Within the didactic category learner characteristics gender was the most important variable. Men had higher self-assessment of specific skills compared to women. This first model explained 16% of the variance in *Specific task skills*. The next block in the regression analysis was frame factors, including the amount of instruction. The results showed that lay instruction contributed more to the variance than professional instruction. It is worth noting that professional lessons are negatively correlated to self-assessment of skills, while lay instruction is positively correlated to self-assessment. The effect of gender is somewhat moderated by adding the amount of instruction to the model. Adding these variables increased explained variance to 21%. The third block

comprises the aspects of content and goals in the training, containing the variable of emphasis on the educational elements and one specific element of clear risk communication. The emphasis placed onto elements by lay instructors was a significant predictor, while the emphasis placed by professional driving instructors was excluded from the analysis due to non-significant effects. Likewise, with regard to clear risk communication, the contribution to variance was limited to that of the lay instructor. The professional instructors' risk communication was excluded due to the lack of significant associations. Explained variance in model 3 was 24%.

The fourth block in the regression contained aspects of the learning process. This category included variables such as indicators of the quality of the communication and the atmosphere in the car, including also formative evaluation and feedback from the instructor. Within this category the two most important variables contributing to the variance were a feeling of security and an atmosphere of confidence. This was the case in lay instruction as well as in professional training. This model explained 29% of the variance in the dependent variable Specific task skills. Through the third and fourth block in the regression the effect of the amount of instruction were moderated. The fifth (and final) block included one control variable, namely driving experience after licensing. The results showed that driving experience contributed considerably to the variance in driving skills. The explained variance in the last model was 31%.

Table 2 Summary of hierarchical regression analysis for variables predicting variance in self-assessment of specific task skills (hierarchical block regression)

Models	B	SE	β	R ²
Model 1: Aspects of learner characteristics				.16
1. Gender	-0.64	0.05	-.34***	
2. Level of education	-0.08	0.03	-.06*	
3. Former experience with driving a motorcycle	-0.31	0.06	-.14***	
4. Judging manoeuvring skills as important for safety	0.19	0.04	.13***	
Model 2: Including also frame factors (amount of instruction)				.21
1. Gender	-0.55	0.05	-.30***	
2. Level of education	-0.09	0.03	-.07**	
3. Former experience with driving a motorcycle	-0.25	0.05	-.12***	
4. Judging manoeuvring skills as important for safety	0.16	0.04	.11***	
5. Numbers of lay instructor lessons	-0.00	0.00	-.18***	
6. Numbers of professional lessons	0.01	0.03	.12***	
Model 3: Including also goals and content				.24
1. Gender	-0.56	0.05	-.30***	
2. Level of education	-0.10	0.03	-.08**	
3. Former experience with driving a motorcycle	-0.23	0.05	-.11***	
4. Judging manoeuvring skills as important for safety	0.14	0.04	.09***	
5. Numbers of lay instructor lessons	-0.00	0.00	-.15***	
6. Numbers of professional lessons	0.01	0.03	.11***	
7. Priority of educational elements – lay instructor	-0.22	0.03	-.16***	
8. Lay instructor's clear risk communication	-0.05	0.01	-.10***	
Model 4: Including the learning process and evaluation				.29
1. Gender	-0.53	0.05	-.28***	
2. Level of education	-0.10	0.03	-.08**	
3. Former experience with driving a motorcycle	-0.20	0.05	-.10***	
4. Judging manoeuvring skills as important for safety	0.12	0.04	.08**	
5. Numbers of lay instructor lessons	-0.01	0.00	-.11***	
6. Numbers of professional lessons	0.01	0.03	.07**	
7. Priority of educational elements – lay instructor	-0.15	0.04	-.11***	
8. Lay instructor's clear risk communication	-0.04	0.01	-.09**	
9. Confident atmosphere between lay instructor and learner	0.11	0.03	.11***	
10. Confident atmosphere between professional trainer and learner	0.09	0.02	.09***	
11. Professional allowed more freedom compared to lay	-0.05	0.02	-.07*	
12. Learner knew instructor's assessment	0.09	0.03	.08**	
13. Lay instructor's nervousness when in challenging traffic situations	-0.07	0.03	-.08*	
14. Lay instructor's unfounded worries	0.05	0.03	.06	
Model 5: Controlling for driving experience after licensing				.31
1. Gender	-0.48	0.05	-.25***	
2. Level of education	-0.07	0.03	-.06*	
3. Former experience with driving a motorcycle	-0.15	0.05	-.07**	
4. Judging manoeuvring skills as important for safety	0.11	0.04	.07**	
5. Numbers of lay instructor lessons	-0.00	0.00	-.10***	
6. Numbers of professional lessons	0.01	0.00	.06*	
7. Priority of educational elements – lay instructor	-0.14	0.03	-.11***	
8. Lay instructor's clear risk communication	-0.04	0.01	-.08**	
9. Confident atmosphere between lay instructor and learner	0.11	0.03	.11***	
10. Confident atmosphere between professional trainer and learner	0.08	0.02	.09***	
11. Professional allowed more freedom compared to lay	-0.05	0.02	-.06*	
12. Learner knew instructor's assessment	0.09	0.03	.08**	
13. Lay instructor's nervousness when in challenging traffic situations	-0.07	0.03	-.08*	
14. Lay instructor's unfounded worries	0.06	0.03	.07*	
15. Driving experience after licensing	-1.44E-005	0.00	-.15***	

*** = $p < .001$, ** = $p < .01$, * = $p < .05$

4. Discussion

4.1 Amount of training

Compared to findings in Sagberg (2000), who found an average amount less than 54 h, the reported amount of accompanied driving of 114.8 h in the present study represents a substantially increased amount of lay instruction in Norway. Also regarding kilometres driven it seems to be an increased amount. The present study showed an amount of 2300 km driven, while it is earlier shown to be 1153 km (Sagberg, 2000; Sagberg & Gregersen, 2005). Ulleberg (2003) found a mean of 2000 km. However, in terms of kilometres lay accompanied driving it is still a gap up to the situation in Sweden; see results from Gregersen and Nyberg (2002), and Sagberg and Gregersen (2005).

The increase in accompanied driving in Norway may be a result of the Norwegian Public Road Administration's efforts to promote lay instruction.

The amount of professional driving lessons is somewhat higher in this study compared with the amount shown by Norwegian Public Roads Administration (2002, 2003, 2004b). Consequently, it seems that the increase in lay accompanied driving has not been at the sacrifice of professional instruction. However, less than 17% had more than 20 practical lessons in driving school, and less than 1% had more than 40 lessons. The total amount of professional lessons is low also for those who have low amounts of lay accompanied driving. Presumably there are certain limitations regarding how much money young learners are able to spend in professional driver training, which therefore hardly can satisfy the need for driving experience before licensing. In order to lower the initial risk for novice drivers by means of increased amount of driving experience before licensing the most realistic way seems to be by increased lay accompanied driving.

4.2 Differences in content

The present study shows that among lay instructors the highest rank with regard to emphasis was placed on speed adjustment, risk avoidance and distance to the car ahead, according to the learners. This is in line with Gregersen and Nyberg (2002) who also showed speed adjustment in addition to risk perception and evaluation to be in focus in lay instruction. Common for these elements are their importance for appropriate safety margins. It is possible that lay instructors, due to the absence of dual control units, depend on or feel dependent on a 'safety margin strategy' when accompanying learners.

In addition, traffic rules and start-up and stopping scored high. The latter is probably a result of the high numbers of learners starting to drive with a lay instructor before attending a driving school. There is reason to believe that emphasis assigned to various aspects of driving changes during the learning period, also in lay instruction. However, there are important aspects of driver training that lay instructors will have problems in covering satisfactorily due to the apparent ‘safety margin strategy’. Overtaking, training in acceleration lanes and driving in the dark are examples of aspects that were assigned low emphasis in lay instruction. Thus, the high emphasis placed on risk avoidance and the low emphasis assigned to overtaking may be indicators of the same strategy.

With two exceptions professional instructors placed greater emphasis to all aspects compared to lay instructors. The exceptions were “start-up and stopping” (in which lay instructors placed statistical significantly greater emphasis compared to professionals), and “importance of choices of what kind of person you want to be” in which the differences were not statistically significant. The latter represents important high order competence according to the GDE-matrix as well as to the curriculum (Peräaho, Keskinen, & Hatakka, 2003; The Norwegian Public Roads Administration, 2004a).

Professional instructors’ tendency to place more focused emphasis to most of the training aspects may support findings from Groeger and Brady (2004), who found that compared to lay instructors, professionals gave more instruction. The present study shows that hazard detection, speed adjustment, traffic rules, importance of predictable driving, and risk avoidance are highly emphasised elements in professional instruction. It is worth noting that hazard detection is considered the most important.

There might be several reasons for professionals to place their emphasis differently from lay instructors. Through educational requirements professionals may have better evaluation skills, better instruction skills and their cars are also better equipped in order to deal with difficult and dangerous driving scenarios in a safe way. In addition they also usually will have valuable experience in instructing young learner drivers. However, it is not obvious that professionals emphasise every aspect of the driver training satisfactory. Environmentally sound driving was given rather low emphasis by both professional and lay instructors. This aspect of driving is relevant at all times on the road and it is clearly emphasised in the teaching plan (Norwegian Public Roads Administration, 2004a), though evidently still not much focused neither in professional practical driver training nor in informal accompanied driving. This may indicate that

the content of driver education must be governed by elements other than just the driver training curriculum.

The greatest differences between lay instructors and professionals occurred with regard to the emphasis on elements such as overtaking, changing lanes, hazard detection, traffic rules, training in acceleration lanes, and the importance of predictable driving. These elements seem to be more or less out of scope for lay accompanied driving. Consequently, they must remain an important area for professional driver training. Professional instructors seem to take other matters into consideration with respect to which elements they emphasise in their instruction. Professional instructors covered the syllabus better, including also demanding driving scenarios, while lay instructors seemed to avoid difficult and dangerous driving scenarios while they emphasised aspects that are on lower levels in the step-wise syllabus, see Gregersen and Nyberg (2002) and Norwegian Public Roads Administration (2004a), and therefore easier for non-professionals to carry out.

4.3 The contribution from the didactic characteristics of the training to the variance in the criterion variables

The analyses derived from the didactic categories showed 31% explained variance in specific task skills. Gender was the most important variable within the category of learner characteristics. It is well known that there are differences between men and women with regard to self-assessment of driving skills (Gregersen & Nyberg, 2002; Tronsmoen, 2008). The results also showed that lessons taken with a lay instructor contributed more to the variance than those taken with a professional instructor. This could be expected due to the higher amount of lay instruction.

The category investigating the learning process contained variables such as indicators of the quality of the communication and the atmosphere in the car including also formative evaluation and feedback from the instructor. Within this category the two most important variables contributing to the variance in self-assessment of specific task skills were a feeling of security and an atmosphere of confidence. This was true for lay instruction as well as for professional training. It is interesting to observe the close relationship between indicators of atmosphere in the training situation and the outcome of the training. Also in other educational contexts this has been shown, see for example Hiim and Hippe (1989b) and Lauvås and Handal (1990) pointing to the capability to

create a confident atmosphere as an asset for successfully developing performance and competence within apprenticeship learning contexts.

The final block included a single control variable, namely driving experience after licensing, and showed driving experience contributing considerably to the variance in driving skills.

The study shows that the examined didactical characteristics of the practical driver training is associated with the development of self-reported driving skills (measured as self-assessment of skills) rather than safety attitudes and behaviour, despite practical driver training behind the wheel being a one-to-one situation, which as a learning situation may provide the possibility to ensure the quality of communication through more individualized personal attention to the learner.

One possible reason for this finding could be that practical driver training, i.e. practice behind the wheel may have an inherent focus on the specific driving task. The learning process in the training may reflect the need for solving the immediate driving tasks determined by the driving situation. However, it may be argued that over time the focus of the instruction will develop in line with the learner's development of skills. If so, increased amounts of practical driver training may also cover important educational aspects which are not being fulfilled today, such as safety attitudes and environmentally sound driving. On the other hand, the association between safety attitudes and lay instruction contradicts this possibility, as the analysis from Tronsmoen (2010) showed a significant negative association between a growing amount of lay instruction and safety attitudes.

The conclusion is that practical driver training must be directed towards attitudinal goals in order to exert an influence on safety attitudes. However, it is not as easy to direct lay instructors as professional instructors, who are required to follow the teaching plan and the syllabus.

4.4 Methodological discussion

The present study is a retrospective cross-sectional survey study. Thus, the study does not allow for conclusions regarding causality. However, by means of the statistical approaches applied in this study it is possible to examine associations between essential

variables and to indicate to what extent assumed determinants explain variance in important outcome variables.

The present study is based on a self-report questionnaire. Young driver self-reports have been shown to be reliable (e.g. Hatakka, Keskinen, Katila, & Laapotti, 1997).

However, self-reports of educational processes may be biased both due to lapses of memory regarding the instruction and from individual differences in the perception of messages. Consequently, it may be claimed that measured differences result from differences in respondents' recall and perception of events as well as from differences in the actual events themselves. However, to capture what the learners have perceived in the learning process we have to ask the learners themselves. In training and education it is what the learners perceive that is the key. Also, in order to examine the association between the teaching and psychological constructs such as safety attitudes and self-assessment, we have to rely on the learners themselves as information sources. In this respect, using a self-report questionnaire is a cost-effective option that yields other possibilities than for example direct observation, which may also contain biases. An ambition of the present study is to provide a part of the truth as seen from the perspective of the learner drivers.

4.4.1 The sample as representative

The analysis shows that gender and urbanisation may affect the distribution of the two training methods. However, on this point the sample reflects the distribution of the population. Although this indicates that there are some external frame factors which influence the amount and distribution of training, there are not sample biases in the distribution of these variables that can affect the results.

The sample was also examined for possible selective recruitment to the two different types of practical driver training. We have no data showing why some learners opt for a great amount of lay instruction while others choose more professional lessons. Choices may be influenced by external causes such as access to a car and an interested lay instructor as well as a suitable driving environment. Internal causes reflecting individual differences such as driving aptitude, interests and personality may have an influence. In other words, it is possible that those who have extensive lay instruction are different in other respects than with regard to randomly distributed external frame factors. The question is whether internal variables are linked to choices of driver

training, with a possible link to the outcome variables as well, indicating a risk for spurious associations between dependent and independent variables.

The analysis shows that school performance in languages and mathematics seems to have little influence on the number of professional lessons taken. However, school performance in physical education is weakly (though significantly) negatively associated with the number of professional lessons. More specifically, low grades in physical education seem to indicate a need for many professional driver training lessons.

The conclusion is that there are individual differences behind the recruitment to different types of training. But they seem to be minor and could not have been controlled for.

4.5 Conclusions

The present study shows that there are significant differences between lay instruction and professional instruction in driver training.

Compared with formal practical driver training, accompanied driving with a lay instructor in Norway has an amount which represents a substantial contribution to driving experience. The insufficiency of lay instruction is that important elements of driving instruction have low emphasis and rank, in particular elements connected with training in high-speed situations such as overtaking, changing lanes and training in acceleration lanes. The benefits and shortcomings of informal driver training, and the differences between formal and informal training, support the view that to create successful driver training, the two types of training need to be integrated into a whole. In particular, elements connected with training in high speeds and risky situations need to be dealt with through professional driver training.

The regression analyses showed that the examined didactical variables connected to the practical driver training, both professional and lay instruction, is mainly associated with the development of self-assessment of driving skills rather than safety attitudes. The educational aspects of greatest importance to self-assessed driving skills were the amount of lay instruction, the communication about risk and the instructors' formative evaluation. Further, variables such as gender and driving experience are strongly associated with driving skills, measured as self-assessment of skills in performing

specific driving tasks. However, we still do not know too much about the source to the associations between practical driver training and the outcome variables, in particular safety attitudes and self-reported driving behaviour. It might be the driving situations themselves, it might result of the experiences learners have done during the driving, or it may result from features connected to the instruction or lack of instruction. It is necessary to find out more about how the instruction is associated with the outcome, and other variables than those examined in the present study might be of importance.

There are indications that lay instruction is dependent on a 'safety margin strategy'; resulting in avoidance of the most challenging aspects of driving during the course of training. Further research is necessary to confirm whether this strategy occurs widely in lay instruction and if so, to examine the consequent effects on learning.

The findings are relevant for other countries considering extensive supervised training as a source for necessary pre-license driving experience. A high amount of informal accompanied driving contributes significant to development of self-reported driving skills. Limitations in informal accompanied driving yield a need for adaptations in both the content and amount of the professional instruction. The present study identifies important components of both formal and informal training that should be addressed.

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Appendix

- I. The papers in a critical perspective: Additional analyses and results
- II. Questionnaire (In Norwegian – Spørreskjema)

Appendix

Appendix I

Appendix I

**The papers in a critical perspective: Additional analyses
and results**

Appendix I

The papers in a critical perspective: Additional analyses and results

One of the specific aims of Paper I was to examine the associations between self-assessment, age and driving experience. Regression analyses were conducted for this purpose.

Supplemental regression analyses including variables such as type of practical training, sex, geography (level of urbanisation in the district where the learner lived during the training), comprehensive school grades and driving experience could contribute to further understanding of relations between variables influencing the scores in self-assessment.

Even though the results in Paper I indicated that formal training mitigates the problem of overconfidence and may help learners who have taken many professional driver training lessons to adopt a more self-critical view of their own driving ability, there may be other variables as well influencing the self-assessment score. Individual differences between students with extensive accompanied driver training with a lay instructor and few professional lessons and those who have the opposite distribution between lay and professional training may also influence the results. In order to clarify whether the associations between the two forms of practical driver training on the one hand and the self-assessment dimensions on the other hand reflect spurious relations rather than an effect of the training itself, four hierarchical regression analyses were carried out, showing the four self-assessment dimensions as dependent variables and the two forms of driver training as determinants in block 1 and controlled for other variables in block 2, (see tables 1-4).

Predictors of variance in self-assessment of general driving ability

This analysis (see appendix Table 1, Block 1) shows that informal driver training is positively associated with general driving ability, i.e. learners with substantial amounts of informal accompanied driving tend to have a high level of self-assessed driving ability along this dimension. The opposite is the case for formal driver training, which seems to be associated with a more self-critical view. The findings are statistically significant, but the associations are weak, accounting for 4% of the variance in general driving ability.

By including sex, age, geography (level of urbanisation in the district where the learner lived during the training), grades in comprehensive school, and driving experience after licensing (block 2), the effect of the training is somewhat moderated, though still statistically significant. The most important variables are sex and driving experience after licensing ($p < 0.01$). Age, geography, and grades in gymnastics also contribute to the variance ($p < 0.05$).

Appendix I

Grades in mathematics and languages did not contribute to the variance in general driving ability. All together, the predictors in Block 2 account for 15% of the variance (table 1).

The conclusion is that despite influence from other variables, the overall relationship between the form of training and general driving ability is retained.

Table 1: Predictors of variance in self-assessment of general driving ability (hierarchical block regression)

General driving ability	β	t	F	R ²
Block 1: Type of practical driver training			29.86***	.04
1. Accompanied driving with a lay person	-.13	-4.44***		
2. Professional driving lessons	.14	5.02***		
Block 2: Controlling for other variables			24.53***	.15
1. Accompanied driving with a lay person	-.09	-3.27**		
2. Professional driving lessons	.09	3.29**		
3. Sex	-.25	-8.97***		
4. Age	-.06	-2.28*		
5. Geography	-.06	-2.20*		
4. Grades in Mathematics	.03	1.05		
5. Grades in Norwegian	.00	0.09		
6. Grades in English	.01	0.46		
7. Grades in Gymnastics	-.07	-2.02*		
8. Driving experience	-.15	-5.06***		

* = $p < .05$. ** = $p < .01$. *** = $p < .001$

Response scales

Self-assessment dimensions: The response scales relate to positively charged statements regarding aspects of driving ability and are as follows: (1) *Completely correct*. (2) *Mostly correct*. (3) *Neither–nor*. (4) *Mostly wrong* and (5) *Completely wrong*

Accordingly, negative values indicate positive associations between the variables in the tables below. However, in Papers I and II the scale is reversed so that high levels of self-assessment correspond with high numbers in the scale.

Attitude dimensions: Ratings of the statements were given on a 5-point scale ranging from ‘Strongly agree’ to ‘Strongly disagree’. Low values correspond to non-ideal attitudes.

Self-reported driving behaviour dimensions: Ratings were given on a 6-point scale ranging from ‘Very often’ to ‘Never’. Low values correspond to high ratings in all the dimensions of self-reported driving behaviour, i.e. low values correspond to non-ideal behaviour.

Geography: (level of urbanisation in the district where the learner lived during the training): (1) *Rural district*. (2) *Densely populated area with less than 10 000 inhabitants*. (3) *Town with less than 50 000 inhabitants* and (4) *City with more than 50 000 inhabitants*.

Appendix I

Grades in comprehensive school: The evaluation scale in comprehensive school is from (6) Excellent to (1) Not passed

Amount of accompanied driving with a lay person: Number of lessons (sessions)

Professional lessons: Number of lessons

Months with a licence: Number of months since the licence was obtained

Driving experience: Estimated numbers of kilometres driven after licensing

Crashes: Number of crashes after licensing (self-reported)

Predictors of variance in self-assessment of safety orientation

Block 1 in table 2 shows that formal driver training is associated with a self-critical view of one's own safety orientation. i.e. learners with many professional driving lessons tend to have less confidence in their own safety skills ($p < 0.01$). Learners with substantial amounts of informal accompanied driving tend to have a high level of self-assessed ability along this dimension, but this result is not statistically significant.

Table 2: Predictors of variance in self-assessment of safety orientation (hierarchical block regression)

Safety orientation	β	T	F	R^2
Block 1: Type of practical driver training			9.24***	.01
1. Accompanied driving with a lay person	-.05	-1.70		
2. Professional driving lessons	.10	3.40**		
Block 2: Controlling for other variables			6.80***	.04
1. Accompanied driving with a lay person	-.05	-1.73		
2. Professional driving lessons	.11	3.60***		
3. Sex	-.10	-3.41**		
4. Age	-.12	-4.12***		
5. Geography	-.06	-2.25*		
4. Grades in Mathematics	-.02	-0.57		
5. Grades in Norwegian	-.07	-2.01*		
6. Grades in English	-.04	-1.34		
7. Grades in Gymnastics	.01	0.34		
8. Driving experience	.00	0.06		

* = $p < .05$. ** = $p < .01$. *** = $p < .001$

This dimension seems to be very stable and only slightly influenced by variables as controlled for in Block 2. Even though the effect of the professional training was somewhat strengthened in Block 2; the effect of the training is low with an explained variance only at 4%.

Predictors of variance in self-assessment along the body dimension

Block 1 shows that informal driver training is positively associated with the body dimension, i.e. learners with substantial amounts of informal accompanied driving tend to have a high level of self-assessed driving ability along this dimension ($P < 0.1\%$) compared to those who have little accompanied driving. The opposite is the case for formal driver training, where high numbers of professional lessons seem to be associated with low scores along this dimension ($p < 1\%$).

Table 3: Predictors of variance in self-assessment of Body dimension (hierarchical block regression)

Body dimension	β	T	F	R^2
Block 1: Type of practical driver training			18.46***	.03
1. Accompanied driving with a lay person	-.13	-4.65***		
2. Professional driving lessons	.07	2.61**		
Block 2: Controlling for other variables			13.59***	.09
1. Accompanied driving with a lay person	-.10	-3.45**		
2. Professional driving lessons	.03	1.10		
3. Sex	-.18	-6.18***		
4. Age	-.02	-.63		
5. Geography	-.02	-.79		
4. Grades in Mathematics	.04	1.36		
5. Grades in Norwegian	-.03	-0.83		
6. Grades in English	-.00	-0.12		
7. Grades in Gymnastics	-.04	-1.30		
8. Driving experience	-.15	-5.04***		

* = $p < .05$. ** = $p < .01$. *** = $p < .001$

However, the effect of the training is somewhat moderated in Block 2 when controlling for sex, age, geography (level of urbanisation in the district where the learner lived during the training), grades in comprehensive school, and driving experience after licensing. The statistically significant effect of formal driver training disappeared. The most important variables contributing to variance in the body dimension are sex and driving experience after licensing in addition to informal accompanied driving ($p < 0.1\%$). Men give themselves higher body dimension scores compared to women. Age, geography, and grades in comprehensive school did not contribute to the variance in the body dimension assessment.

The conclusion is that the explained variance from formal driver training is due to confounding variables, while informal training retains its explained variance although it is somewhat moderated.

Predictors of variance in self-assessment of specific task skills

Block 1 shows that informal driver training is positively associated with specific task skills, i.e. learners with substantial amounts of informal accompanied driving tend to have a high level of self-assessed driving ability along this dimension ($p < .001$). The opposite is the case for formal driver training, which seems to be associated with a more self-critical view ($p < .001$). The two types of practical driver training explained 10 % of the variance in specific task skills.

The effect of the training is somewhat moderated in Block 2 when controlling for sex, age, geography (level of urbanisation in the district where the learner lived during the training), grades in comprehensive school, and driving experience after licensing. The most important variables are sex and driving experience after licensing, in addition to the two forms of training ($p < .001$). Age and grades in gymnastics contributed to the variance with a significance level of $p < 5\%$ and $p < 1\%$ respectively. Grades in mathematics and languages did not contribute to the variance in specific task skills. Neither did geography (level of urbanisation in the training area). The explained variance in block 2 was 23 %.

Table 4: Summary of hierarchical regression analysis for variables predicting variance in self-assessment of specific task skills (hierarchical block regression)

Specific task skills	β	t	F	R^2
Block 1: Type of practical driver training			71.81***	.10
1. Accompanied driving with a lay person	-.21	-7.80***		
2. Professional driving lessons	.19	6.85***		
Block 2: Controlling for other variables			38.71***	.23
1. Accompanied driving with a lay person	-.17	-6.58***		
2. Professional driving lessons	.13	4.74***		
3. Sex	-.24	-9.21***		
4. Age	-.05	-2.01*		
5. Geography	-.03	-1.20		
4. Grades in Mathematics	.01	0.30		
5. Grades in Norwegian	.05	1.68		
6. Grades in English	.02	0.77		
7. Grades in Gymnastics	-.09	-3.01**		
8. Driving experience	-.18	-6.35***		

* = $p < .05$. ** = $p < .01$. *** = $p < .001$

The conclusion is that there are statistically significant relations between the self-assessment dimensions other than the relations between driver training and self-assessment. However, the effect of the training is retained, even though it is somewhat moderated when controlling for

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these confounding variables. It should be noted that the contribution to the variance is rather low. The impact seems to be strongest on general driving ability and specific task skills. However, the contribution of self assessment of driving ability on variance in accidents (see Paper II) is mainly connected to the two other and less explainable dimensions, namely the body dimension and safety orientation. It is a paradox that the most important dimensions for explaining variance in crash involvement (Paper II) are the dimensions which are only slightly associated with variables examined in this study. In other words the contributors to the most important self-assessment dimensions are largely unidentified. In order to prevent accident involvement among young drivers by influencing these dimensions there is apparently a need to identify predictors for variance both in the body dimension and in the safety orientation dimension.

Recruitment to the two types of practical driver training

There may be individual differences between students with substantial amounts of accompanied driver training with a lay instructor and few professional lessons and those who have the opposite distribution between lay and professional training. Paper I argues that geographical conditions may influence the possibility for lay accompanied driver training. However, this hypothesis was not tested in this paper. Nevertheless, analysing possible predictors influencing the amount of lay instruction and professional lessons is of interest.

This question is discussed further in Papers II and III. The discussion in Paper III is with reference to two regression analyses using the amount of lay instruction and professional driver training as dependent variables, while level of urbanization in the training area, sex, school grades, and traffic experience were entered as predictors. As the regression analyses were not reported in the paper, they are provided here.

Table 5: Summary of regression analyses for variables predicting variance in the form of practical driver training

	β	T	F	R ²
Accompanied driving with a lay person (amount)			21.72***	.11
Sex	.10	3.76***		
Geography	-.10	-3.91***		
Age when lay instruction started	-.29	-10.88***		
Educational level	-.01	-.21		
Grades in Mathematics	-.03	-.91		
Grades in Norwegian	.05	1.49		
Grades in English	-.05	-1.53		
Grades in Gymnastics	.06	1.73		
Professional driving lessons (numbers)			17.48***	.09
Sex	-.16	-6.00***		
Geography	.12	4.53***		
Age when lay instruction started	.17	6.18***		
Educational level	.06	2.18*		
Grades in Mathematics	-.04	-1.24		
Grades in Norwegian	.06	1.91		
Grades in English	.01	.27		
Grades in Gymnastics	-.11	-3.32**		

* = $p < .05$ ** = $p < .01$ *** = $p < .001$

The conclusion is that there are individual differences behind the recruitment to different types of training. However, they seem to be minor and could not have been controlled for.

Gender differences in self-assessment of driving ability

The analyses in Paper I show that gender differences did not seem to depend on differences in driving experience. However, Section 4.1.1 in the thesis points out that the association between self-assessment and the sex differences is not reported in a way that takes into account how sex differences are moderated by driving experience. This can be illuminated by applying regression analyses to two models, one with only sex as determinant, the second controlled for the effect of driving experience:

Table 6: Regression analyses of dimensions of self-assessment and sex controlled for driving experience.

General driving ability	β	t	F	R ²
Model 1			147.91***	.10
Sex	-.31	-12.16***		
Model 2: Controlling for driving experience			103.53***	.13
Sex	-.26	-10.19***		
Driving experience	-.19	-7.31***		
Safety orientation	β	t	F	R ²
Model 1			12.84***	.01
Sex	-.10	-3.58***		
Model 2: Controlling for driving experience			8.12***	.01
Sex	-.08	-3.02**		
Driving experience	-.05	-1.84		
Body dimension	β	t	F	R ²
Model 1			70.06***	.05
Sex	-.22	-8.37***		
Model 2: Controlling for driving experience			56.29***	.08
Sex	-.18	-6.67***		
Driving experience	-.17	-6.36***		
Specific task skills	β	t	F	R ²
Model 1			187.52***	.12
Sex	-.37	-13.69***		
Model 2: Controlling for driving experience			142.59***	.17
Sex	-.29	-11.41***		
Driving experience	-.24	-9.28***		

* = $p < .05$ ** = $p < .01$ *** = $p < .001$

These analyses show that both driving experience and sex are important for self-assessment. However, in all the models sex is more important than driving experience. We can also see that driving experience only modestly moderates the effect of sex. For the safety orientation dimension we can see that the association between self-assessment and driving experience is not statistically significant. These results support the conclusion in Paper I that sex differences are not due to differences in driving experience between men and women.

The association between the two forms of practical driver training and crash involvement

The relationship between the two forms of driver training and crash involvement is not examined in any of the papers. However, the self-assessment dimensions as well as the safety

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attitudes and risk behaviour dimensions have been examined for their relationship to crash involvement. As can be seen, this is important due to the need for good substitutes for crash involvement as an effect variable to be influenced by driver training, while crash involvement as such is a very difficult outcome variable for measuring the safety effects of driver training.

Particularly when it comes to evaluation of educational processes as road safety measures, there is a need for criterion variables other than crash involvement, which is impossible to evaluate other than over a long time span.

However, due to the presence of accident data for the sample, it is possible to examine the association between driver training and crash involvement directly.

The thesis describes different ways of measuring risk. In Paper I a risk measure was used consisting of a fraction in which the numerator was the number of crashes. Driving experience (kilometres driven) was applied as an exposure measure in the denominator. In Paper II negative binomial regression was applied with the number of crashes as the dependent variable and the dimensions of self-assessment of driving ability, safety attitudes and behaviour as the independent variables, controlling for exposure by using the number of months since licensing as a covariate. None of the papers examined the association between driver training and risk.

Consequently, statistical analyses were carried out to provide additional results regarding the associations between the forms of driver training and crash involvement or risk. Firstly, a correlation analysis was applied including the described risk measure. Subsequently, a logistic regression analysis with a dichotomised variable for the number of crashes was used as the dependent variable and the training variables as independent variables. A negative binomial regression analysis was also conducted in order to examine the relationship with a crash variable retaining the complete variance in number of crashes.

The only analysis which showed successful associations between driver training and risk was the correlation analysis. This analysis showed a negative correlation between the amount of supervised driving and risk ($p < .05$); however the correlation coefficient was only $-.07$, accounting for less than 0.5% of the variance. Only informal driver training showed a statistically significant relationship. The logistic regression and the negative binomial regression did not provide statistically significant results.

Unfortunately, attempts to show the direct effect between driver training and crash involvement did not yield satisfactory results. As can be seen in the correlation matrix in the appendix, there are only weak associations between the amount of training and crash

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involvement. Logistic regression as well as negative binomial regression analyses showed the same result; there were no statistically significant associations when controlling for other variables such as driving experience and months with a licence. This is in contrast to the results of Gregersen, Berg, Engström, Nolén, Nyberg, and Rimmö (2000). The results from the present study rather support the view that the crash involvement variable is a poor way of measuring the effect of driver training (this question is discussed elsewhere in the thesis).

However, Sagberg (2002) found that there were thresholds for the safety effect of informal accompanied driving. He showed that in the beginning the accident risk grew along with increased accompanied driving up to a certain level, then decreased rapidly once this level was reached. The explanation for the disappointing results in the present study may very well be that such thresholds are rather high: the amount of training should be even higher than the level attained by the sample in this study.

Based on his calculations, Sagberg (2002) has estimated the recommended threshold level with regard to the amount of supervised driving in order to gain a safety effect. Making a conservative estimate, he recommends an increase in supervised driving by approximately 2000 kilometres in addition to the measured level of 2000 kilometres, i.e. a total amount of 4000 kilometres. In the present study the amount of lay accompanied driving is estimated at approximately 2300 kilometres (Paper III), indicating that the amount is still probably too low to reduce crash involvement substantially.

The correlation matrix is attached in the appendix. Due to weak and inconsistent results, the other analyses of the relationship between training and crash involvement are not reported.

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Table 7: Negative binomial regression analyses of self-assessment of driving ability, safety attitudes, risk behaviour and months with a licence: explained variance in crash involvement, supplemented with Wald chi-square and Standardized Beta

	Over-dispersion parameter	B	Std. Error	Wald	B	Explained part of systematic variance (per cent)	Explained total variance (per cent)
Self-assessment	0.8616					82.5	64
General driving ability		-0.226	0.0993	5.19*	-.145		
Safety orientation		0.761	0.1040	53.51***	.415		
The body dimension		-0.376	0.0875	18.43***	-.261		
Specific task skills		-0.013	0.0566	0.05	-.012		
Months with a licence		0.038	0.0048	64.62***	.358		
Safety attitudes	0.9633					80.0	62.4
Attitude towards rule violations and speeding		-0.297	0.0658	20.29***	-.207		
Attitude towards the careless driving of others		0.058	0.0473	1.49	.054		
Attitude towards drinking and driving		-0.188	0.0639	8.64**	-.118		
Months with a licence		0.036	0.0046	61.39***	.340		
Risk behaviour	0.9581					80.7	62.5
Violation		-0.240	0.0630	14.48***	-.199		
Mistakes		-0.237	0.0993	5.69*	-.149		
Inattention		0.030	0.1005	0.09	.018		
Inexperience		0.140	0.0858	2.66	.094		
Months with a licence		0.034	0.0047	51.95***	.317		

* = p <.05. ** = p <.01. *** = p <.001

Dependent variable: Crash involvement (numbers of accidents)

Some important values are absent in the original table in Paper II, as indicated in the synopsis (4.1.2). A revised version of the table is presented here. This new version includes standardized Beta in addition to Wald chi-square, which was omitted in the original table. Standardized Beta and Wald Chi-square are rather similar, however with one difference: For the self-assessment instrument Wald Chi-square shows months with a licence to be the most important variable while Beta shows the highest value for the safety orientation variable.

It is probably difficult to compare such different variables: psychometric measures on the one hand and the exposure measure of months with a licence on the other hand. The variables are

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in their nature so different that the only useful observation is that the statistical significance level is high for both. Comparisons should probably be limited to the psychometric measures, which in their nature are of a similar character.

Young drivers with limited amounts of driving experience have the best attitudes and driving behaviour. In line with increasing amounts of driving experience, attitudes and their self-reported behaviour develop in a less ideal direction. More driving experience means more accidents due to the increasing exposure. The result is that drivers with less ideal attitudes and behaviour have more accidents. However, it is well known that due to the safety effect of driving experience the true picture is that those who drive more are the safest drivers. Consequently, it could be expected that correcting for an exposure measure would reverse the picture, so that those who have the less ideal attitudes and behaviour appear as the safest drivers.

However, the present study does not give evidence to support such a conclusion.

Table 8: Correlation analysis including the risk measure, the self assessment dimensions and the two forms of practical driver training

	1	2	3	4	5	6	7	8	9	10
1. Crashes	1									
2. Professional driving lessons	.01	1								
3. Accompanied driving with a lay person	-.00	-.25***	1							
4. Driving experience	.14***	-.13***	.15***	1						
5. General driving ability	-.06*	.18***	-.15***	-.26***	1					
6. Safety orientation	.05	.11***	-.07*	-.07**	.59***	1				
7. Body dimension	-.08**	.12***	-.15***	-.21***	.65***	.58***	1			
8. Specific task skills	-.07**	.23***	-.26***	-.31***	.52***	.36***	.51***	1		
9. Months with a licence	.14***	-.02	.07*	.50***	-.16***	-.13***	-.11***	-.18***	1	
10. Risk	.24***	.03	-.07*	-.18***	.07**	.09***	.08**	.12***	-.10***	1

* = $p < .05$ ** = $p < .01$ (2-tailed)

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Table 9: Correlation matrix – Self-assessment and background variables - Pearson's R

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. General driving ability	1												
2. Safety orientation	.59 ***	1											
3. Body dimension	.65 ***	.58 ***	1										
4. Specific task skills	.52 ***	.36 ***	.51 ***	1									
5. Accompanied driving with a lay person	-.15 ***	-.07 *	-.15 ***	-.26 ***	1								
6. Professional driving lessons	.18 ***	.11 ***	.12 ***	.23 ***	-.25 ***	1							
7. Sex	-.32 ***	-.09 **	-.22 ***	-.35 ***	.12 ***	-.20 ***	1						
8. Age	-.10 ***	-.11 ***	-.06 *	-.09 **	-.04	.12 ***	-.02	1					
9. Geography	-.04	-.07 **	-.00	.01	-.13 ***	.12 ***	.02	.03	1				
10. Grades in Mathematics	.01	-.06 *	.01	-.00	-.02	-.03	-.02	.02	.08 **	1			
11. Grades in Norwegian	.04	-.07 **	.01	.08 **	-.00	.04	-.16 ***	.03	.04	.38 ***	1		
12. Grades in English	.06 *	-.06 *	.03	.08 **	-.06 *	.04	-.16 ***	-.00	.08 **	.31 ***	.46 ***	1	
13. Grades in Gymnastics	-.08 **	-.07 **	-.05 *	-.09 **	.03	-.08 **	.05	.03	.05 *	.43 ***	.48 ***	.43 ***	1
14. Driving experience	-.26 ***	-.07 **	-.21 ***	-.31 ***	.15 ***	-.13 ***	.25 ***	.35 ***	-.06 *	.01	-.11 ***	-.11 ***	.01

* = p < .05. ** = p < .01. *** = p < .001 (2-tailed)

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Table 10: Correlation matrix – Driver training, psychometric variables, crash involvement, risk, exposure - Pearson's R

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Crashes	1															
2. Professional driving lessons	.01	1														
3. Accompanied driving with a lay person	-.00	-.25***	1													
4. Driving experience	.14***	-.13***	.15***	1												
5. Attitude towards rule violations and speeding	-.10***	.17***	-.14***	-.24***	1											
6. Attitude towards the careless driving of others	-.00	.07**	-.01	-.06*	.34***	1										
7. Attitude towards drinking and driving	-.07**	.035	.04	-.03	.21***	.20***	1									
8. Violation behaviour	-.12***	.13***	-.12***	-.24***	.58***	.34***	.21***	1								
9. Mistakes	-.10***	.01	-.06*	-.09**	.35***	.29***	.26***	.53***	1							
10. Inattention	-.05	-.08**	.01	-.04	.21***	.21***	.22***	.43***	.64***	1						
11. Inexperience	-.01	-.13***	.07**	.16***	.05	.14***	.15***	.22***	.56***	.62***	1					
12. General driving ability	-.06*	.18***	-.15***	-.26***	.36***	.11***	.05	.25***	-.04	-.05	-.28***	1				
13. Safety orientation	.05	.11***	-.07*	-.07**	.06*	-.08**	-.10***	-.02	-.25***	-.15***	-.27***	.59***	1			
14. Body dimension	-.08**	.12***	-.15***	-.21***	.22***	-.01	-.02	.10***	-.14***	-.16***	-.34***	.65***	.58***	1		
15. Specific task skills	-.07**	.23***	-.26***	-.31***	.22***	.05	-.01	.16***	-.05	-.10***	-.34***	.52***	.36***	.51***	1	
16. Months with a licence	.14***	-.02	.07*	.50***	-.10***	.01	-.02	-.16***	-.09**	-.08**	.05	-.16***	-.13***	-.11***	-.18***	1
17. Risk	.24***	.03	-.07*	-.18***	.03	-.01	-.02	.04	-.02	-.02	-.09**	.07**	.09***	.08**	.12***	-.10***

* = p < .05. ** = p < .01. *** = p < .001 (2-tailed)

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Table 11: Correlation matrix – Specific task skills, didactic variables – Pearson’s R

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Gender	1														
2. Level of education	-.11***	1													
3. Former experience with driving a motorcycle	.20***	.03	1												
4. Judging manoeuvring skills as important for safety	.09**	-.02	.01	1											
5. Numbers of lay instructor lessons	.12***	-.03	.09**	-.05	1										
6. Numbers of professional lessons	-.20***	.08**	-.13***	.04	-.25***	1									
7. Priority of educational elements – lay instructor	-.15***	-.03	-.02	-.18***	.15***	-.06*	1								
8. Lay instructor’s clear risk communication	.17***	-.08**	.07*	.07**	.05	-.01	-.27***	1							
9. Confident atmosphere between lay instructor and learner	-.11***	.05	-.10***	.08**	-.30***	.26***	-.20***	-.02	1						
10. Confident atmosphere between professional trainer and learner	.03	.02	-.08**	.08**	-.06*	.09**	-.05*	.07*	.22***	1					
11. Professional allowed more freedom compared to lay	.10***	-.01	.02	-.00	.16***	-.15***	.15***	.06*	-.34***	.06*	1				
12. Learner knew instructor’s assessment	-.04	-.03	-.06*	.05	-.09**	.14***	-.23***	.10***	.28***	.12***	-.14***	1			
13. Lay instructor’s nervousness when in challenging traffic situations	.01	.02	.03	-.06*	.13***	-.15***	.17***	.08**	-.40***	-.04	.49***	-.18***	1		
14. Lay instructor’s unfounded worries	-.04	-.02	.05	-.06*	.08**	-.14***	.17***	.04	-.34***	-.04	.43***	-.14***	.62***	1	
15. Driving experience after licensing	.25***	.11***	.23***	-.03	.15***	-.13***	.01	.04	-.12***	-.05	.10***	-.06*	.10***	.10***	1
16. Specific task skills	-.35***	-.03	-.20***	.10***	-.26***	.23***	-.13***	-.17***	.31***	.15***	-.20***	.21***	-.19***	-.11***	-.31***

* = p < .05. ** = p < .01. *** = p < .001 (2-tailed)

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References:

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- Sagberg, F. (2002). *Mengdetrening, kjøreeerfaring og ulykkesrisiko*. [Extensive accompanied driving, driving experience and crash risk]. TØI-rapport 566/2002. Oslo: Institute of Transport Economics. (In Norwegian, with English summary)

Appendix II

Appendix II

Questionnaire (In Norwegian – Spørreskjema)

Appendix II

SPØRREUNDERSØKELSE OM FØREROPPLÆRING

LES DETTE FØR DU BESVARER SKJEMAET!

OM UNDERSØKELSEN

Hensikten med denne undersøkelsen er å finne ut mer om forholdet mellom privat øvingskjøring og opplæring gitt av kjøreskole. Målet er en bedre føreropplæring. Ved å besvare skjemaet gir du ditt bidrag til å få fram ny kunnskap som kan gjøre det mulig å forbedre trafikksikkerheten.

Vegdirektoratet har med utgangspunkt i førerkortregisteret trukket et representativt utvalg av personer i alderen 18-20 år som har førerkort klasse B. Du er en av de som er trukket ut til å delta i undersøkelsen. Det er frivillig å delta. Vi håper du vil gå gjennom skjemaet og fylle det ut, med utgangspunkt i dine erfaringer. Det vil ta ca 20 minutter. Det er ingen "rette" eller "gale" svar på spørsmålene – det er dine oppriktige meninger og oppfatninger vi er interessert i.

Vegdirektoratet har tatt initiativet til og står bak undersøkelsen, og den gjennomføres av prosjektleder Torbjørn Tronsmoen og professor Torbjørn Rundmo ved Norges teknisk-naturvitenskapelige universitet (NTNU). Datamaterialet fra undersøkelsen vil også bli brukt i prosjektleders doktorgradsarbeid. Prosjektet avsluttes i 2007, og datamaterialet vil da bli anonymisert.

PREMIETREKNING

Alle som besvarer spørreskjemaet er med i trekningen av følgende premier:

- 1 Fujitsu-Siemens bærbar PC med 80 Gb harddisk fra Expert inkl. Experts egen 3-års service og support.
- 5 Creative Zen Micro Mp3 spillere 6 Gb med FM-radio, stemmeopptak, kalender, etc.

Trekningen finner sted så snart datainnsamlingen er avsluttet.

KONFIDENSIALITET

All informasjon behandles konfidensielt. Navn blir ikke registrert i databasen. Ved behandlingen av dataene framgår det derfor ikke hvem som har gitt hvilke svar. Nummeret som står på skjemaet vil bare bli brukt i premietrekningen. Prosjektet er meldt til Personvernombudet for forskning, Norsk samfunnsvitenskapelig datatjeneste AS

HAR DU SPØRSMÅL?

Kontakt Torbjørn Tronsmoen, e-post torbjorn.tronsmoen@svt.ntnu.no eller tlf. 958 94 840.

Torbjørn Tronsmoen
prosjektleder, cand. polit.

Torbjørn Rundmo
professor, dr. philos.



Skjemaet skal leses av en maskin. Følg derfor disse reglene:

- *Bruk svart eller blå kulepenn. Skriv så tydelig du kan, og ikke skriv utenfor feltene. Kryss av slik:*
- *Krysser du feil, fyller du hele feltet med farge, slik:* *Sett så kryss i rett felt.*
- *Ikke kopier dette skjemaet – bruk bare originalen. Kopier blir ikke lest.*
- *Sett bare ett kryss på hvert spørsmål om ikke annet er oppgitt.*
- *Når du har fylt ut skjemaet, returnerer du det i vedlagte, frankerte returkonvolutt.*

BEGREPSDEFINISJONER

- Med "privat ledsager" eller bare "ledsager" mener vi alle du har øvingskjørt med førerprøven og som ikke er kjørelærer ved en kjøreskole.
- Med "kjørelærer" mener vi kjørelærer du har kjørt med i regi av en kjøreskole, mot betaling.

I dette spørreskjemaet får du flere spørsmål om ledsager og kjørelærer. Dersom du har hatt mer enn en ledsager og/eller kjørelærer, svarer du for den du kjørte mest med.

HVA SLAGS FØREROPPLÆRING HAR DU HATT?

Disse spørsmålene handler om forhold som kanskje ligger noe tilbake i tid. Det er likevel viktig at du prøver å svare så godt du kan. Husker du ikke så nøyaktig, kan du gjøre et omtrentlig anslag.

1. Hvor mange kjøretimer hadde du totalt ved kjøreskole (praktisk opplæring)? NB: Regn ikke med timer i glattkjøring og mørkekjøring! kjøretimer
2. Hvem har du øvingskjørt mest med privat? NB: Bare ett kryss! Regn ikke med øvingskjøring med kjørelærer. Mor..... ₁ Søsken..... ₃
Far ₂ Annen slektning eller bekjent ₄
3. Hvor gammel var du da du øvingskjørte privat for første gang? år og mnd.
4. Hvor mange øvingsøkter hadde du privat, med ledsager i hele din opplæringsperiode? For eksempel vil 3 ganger i uka i to år gi ca 300 økter, to ganger i uka i ett år gir ca 100 økter. Gi et rimelig anslag for hvor mange økter du hadde: Jeg hadde ca øvingsøkter
5. Hvor lang tid varte en gjennomsnittlig øvingsøkt? Gi et rimelig anslag. NB: Svar i antall minutter. Eksempel: 1 ½ time = 90 minutter. Ca minutter
6. Hvor mange kjøretimer tok du på kjøreskole før du begynte å øve privat? Ingen ₁ 3 – 5 kjøretimer..... ₃
1 – 3 kjøretimer..... ₂ Mer enn 5 kjøretimer ₄

INNHALDET I OPPLÆRINGEN

7. Nedenfor finner du noen aktuelle temaer, ferdigheter og faktorer som kan være elementer i opplæring av bilførere. I hvilken grad la din private ledsager og din kjørelærer vekt på hvert av disse temaene i din opplæringsperiode? Sett to kryss på hver linje, ett for hvor sterkt temaet ble vektlagt av privat ledsager, og ett for hvor sterkt temaet ble vektlagt av kjørelærer. Svar på en skala fra 1 til 5.

	Av privat ledsager:					Av kjørelærer:				
	Ikke berørt				Svært sterkt vektlagt	Ikke berørt				Svært sterkt vektlagt
	1	2	3	4	5	1	2	3	4	5
1. Sittestilling og justering og bruk av sete/belte/hodestøtter.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Igangsetting og stans.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Å tilpasse farten til forholdene	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Oppdage og bedømme risikoforhold	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Plassering ved møting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Forbikjøring.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Skifte av kjørefelt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Betydningen av å ta hensyn til myke trafikanter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Kjøring i lysregulert kryss.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Kjøring i kryss uten lysregulering.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Øving av ferdigheter i å <u>manøvrere</u> kjøretøyet under alle forhold	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Samarbeid med andre i trafikken.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Betydningen av å kjøre tydelig og forutsigbart.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Betydningen av å unngå situasjoner med høy risiko	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Å kjøre så miljøvennlig som mulig	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Å innse dine egne begrensninger som fører.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Øving i bruk av akselerasjonsfelt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Øving på kjøreteknikk i svinger på landeveg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Avstand til forankjørende	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Virkningen av alkohol.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Faren ved manglende bruk av bilbelte.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Faren ved unge passasjerer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Betydningen av å gjøre kloke valg om hva slags person en ønsker å være	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Kunnskap om trafikkreglene og betydningen av å følge dem	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Betydningen av å vurdere egen ferdighet opp mot kjøremåte.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26. Andre viktige forhold som ble vektlagt av privat ledsager:

27. Andre viktige forhold som ble vektlagt av kjørelærer:

TO ØVINGSSITUASJONER – HVA VILLE SKJEDD?

8. *Situasjon 1:* Se for deg en tenkt situasjon under opplæring der du kjører på vanlig svingete asfaltert landeveg. Du nærmer deg en ganske krapp sving og velger å kjøre litt fort, ikke så fort at du vurderer det som farlig, men likevel såpass fort at det er spennende og litt morsomt å kjenne på hvordan bilen oppfører seg. Du vet at du kjører fortere enn din ledsager/kjørelærer normalt ville ha gjort i den situasjonen.

1. Hvordan ville din private ledsager evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville sagt klart fra Ville ikke sagt noe

2. Hvordan ville din kjørelærer evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville sagt klart fra Ville ikke sagt noe

3. Hvordan forestiller du deg at din private ledsager ville se på situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville mislike det sterkt Ville ikke bry seg om det

4. Hvordan forestiller du deg at din kjørelærer ville se på situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville mislike det sterkt Ville ikke bry seg om det

5. Når ville din private ledsager evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Så snart svingen kom til syne Ville ventet til etterpå

6. Når ville din kjørelærer evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Så snart svingen kom til syne Ville ventet til etterpå

9. *Situasjon 2:* Du er i ferd med å nærme deg et kryss som er forholdsvis uoversiktlig, og der det kan forventes at det vil komme andre trafikanter på kryssende kurs. Du kjører på helt normal måte, men antakelig fortere enn det ledsager/kjørelærer ville ha gjort mot et slikt kryss.

1. Hvordan ville din private ledsager evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville sagt klart fra Ville ikke sagt noe

2. Hvordan ville din kjørelærer evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville sagt klart fra Ville ikke sagt noe

3. Hvordan forestiller du deg at din private ledsager ville se på situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville mislike det sterkt Ville ikke bry seg om det

4. Hvordan forestiller du deg at din kjørelærer ville se på situasjonen?

1 2 3 4 5 6 7 8 9 10
Ville mislike det sterkt Ville ikke bry seg om det

5. Når ville din private ledsager evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Så snart krysset kom til syne Ville ventet til etterpå

6. Når ville din kjørelærer evt. sagt fra i denne situasjonen?

1 2 3 4 5 6 7 8 9 10
Så snart krysset kom til syne Ville ventet til etterpå

10. Grep din private ledsager noen gang inn i situasjonen under øvingskjøring ved å ta tak i rattet eller bruke håndbremsen?

Aldri ₁ 3 – 4 ganger ₃
1 – 2 ganger ₂ 5 ganger eller mer ₄

11. Grep din kjørelærer noen gang inn i situasjonen under øvingskjøringen ved å ta tak i rattet eller bruke pedalene på sin side?

Aldri ₁ 3 – 4 ganger ₃
1 – 2 ganger ₂ 5 ganger eller mer ₄

OM LEDSAGER OG KJØRELÆRER

12. Når du tenker tilbake på kjøretreningen, hvor enig eller uenig er du i disse påstandene om forholdet mellom deg selv og kjørelærer/ledsager (den du kjørte mest med privat)?

Ett kryss på hver linje.

	Svært enig 1	Enig 2	Både /og 3	Uenig 4	Svært uenig 5
1. Jeg visste til enhver tid hva ledsageren min mente om hvordan jeg løste oppgavene mens jeg kjørte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Jeg visste til enhver tid hva kjørelæreren mente om hvordan jeg løste oppgavene mens jeg kjørte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Kjørelæreren ga meg tilbakemeldinger som gjorde at jeg fikk større selvtillit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Ledsageren ga meg tilbakemeldinger som gjorde at jeg fikk større selvtillit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Ledsageren var ofte svært engstelig under kjøring.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Kjørelæreren var ofte svært engstelig under kjøring.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Jeg følte meg vanligvis avslappet og trygg når jeg kjørte med ledsager	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Jeg følte meg vanligvis avslappet og trygg når jeg kjørte med kjørelærer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Det hadde vært en fordel om også ledsageren hadde hatt ekstra pedalsett i bilen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Det var stort sett mer snakk om bilkjøring med kjørelærer enn med ledsager	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Kjørelæreren stolte mer på meg enn hva ledsageren gjorde.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Ledsager var mer opptatt enn kjørelæreren av hva som kunne ha betydning for sikkerheten når jeg kjørte bil	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Kjørelærer var mer opptatt av framkommelighet enn av sikkerhet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Når jeg kjørte med ledsager mener jeg at han eller hun ofte bekymret seg for kjøringen min uten grunn	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Ledsageren min var alltid nervøs foran vanskelige situasjoner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Kjørelæreren min var alltid nervøs foran vanskelige situasjoner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Kjørelæreren overlot mer av kontrollen til meg enn hva ledsager gjorde.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ATFERD I TRAFIKKEN

Spørsmålene hittil har stort sett handlet om føreropplæringen din. Nå kommer noen spørsmål om din rolle som bilfører og trafikant. Svar raskt, men nøyaktig uten å gruble for lenge på de ulike situasjonene. Vær oppriktig!

13. Enhver bilfører bryter fra tid til annen regler og tar sjanser i trafikken.
Hvor ofte skjer det med deg at du ...

	Svært ofte 1	Ofte 2	Av og til 3	Ganske sjelden 4	Svært sjelden 5	Aldri 6
1. Kjører bevisst for fort for å følge trafikkrytmen.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Kjører forbi en forankjørende når denne setter ned farten pga. lavere fartsgrense.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Overser grønn pil på trafikklys som viser at du kan svinge.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Glemmer å løse ut håndbrekket/parkeringsbremsen ved igangsetting.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Kjører svært nær en forankjørende bil for å få føreren til å kjøre fortere eller svinge til siden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Glemmer å blende ned ved mørkekjøring og blir minnet på det av møtende bilister som blinker med fjernlyset.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Øker farten ved lyssignal som lyser grønt/gult for å rekke over før signalet skifter til rødt.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Parkerer bevisst feil for å gjøre et kort ærend.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Kjører forbi et forbudsskilt, f.eks. "Innkjøring forbudt", fordi du ikke har sett skiltet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Overser vikepliktskilt så du så vidt unngår sammenstøt med trafikk som har forkjørsrett	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Kjører feil fordi du har sett feil på et vegvisningsskilt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Ikke ser at trafikklyset har skiftet til grønt.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Kjører bevisst for fort på store veger når det er liten trafikk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Oppdager at du kjører i nest høyeste gir på en lengre strekning selv om farten tilsier at du godt kunne kjørt i høyeste gir	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Er usikker på hvor du har parkert bilen på en stor parkeringsplass eller i et parkeringshus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Har tenkt å rygge, men oppdager at bilen går forover fordi du har bilen i første gir i stedet for i revers (eller omvendt)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Kjører over fartsgrensen ved forbikjøring for å komme forbi så raskt som mulig.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Overser vegskilt som forteller at vegen for tiden er stengt.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Har tenkt å kjøre til et sted du normalt ikke kjører til og oppdager at du av gammel vane er på veg til et sted du kjører ofte til	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Overser avkjørsler på motorveg og må kjøre en lang omveg	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Feilbedømmer vegforholdene og oppdager at bremselengden er lengre enn du trodde.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Setter bilen i feil gir når du kjører.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Har tenkt å sette på for eksempel vindusviskerne, men tar feil og setter på noe annet i stedet, f.eks. blinklyset	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Glemmer hvilket gir bilen er i og må kjenne etter med hånden eller se etter... ..	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Kjører bevisst ut like foran et kjøretøy på hovedveg selv om det ikke er noen bak dette kjøretøyet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Svært ofte 1	Ofte 2	Av og til 3	Ganske sjelden 4	Svært sjelden 5	Aldri 6
26. Feilbedømmer avstanden til møtende bil ved forbikjøring og må presse deg inn like foran den du har kjørt forbi.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Svinger til høyre inn på en hovedveg foran et kjøretøy som du ikke har sett eller som du har feilbedømt hastigheten på.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Forsøker å skifte til et høyere gir når du allerede kjører i høyeste gir.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Parkerer feil i mangel på godkjent parkeringsplass i nærheten.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Feilbedømmer farten ved avkjøring fra hovedveg og må bremse kraftig.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Kutter svinger og kjører over i venstre kjørefelt i venstresving på landeveg selv om det er kort sikt framover.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Feilbedømmer avstanden til møtende kjøretøy ved venstresving og tvinger den møtende til å bremse.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Undervurderer farten på møtende kjøretøy ved forbikjøring.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OM DEG SELV SOM BILFØRER

14. Her følger en del påstander om hvordan det kan oppleves å være bilfører.

Hvor riktige er disse påstandene for deg?

Ett kryss på hver linje.

	Helt riktig 1	Mest riktig 2	Både /og 3	Mest feil 4	Helt feil 5
1. Jeg føler meg sikker på at jeg vet hva slags situasjoner og handlinger som kan være farlige.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Det er sjelden at farlige situasjoner kommer brått på meg når jeg kjører bil.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Jeg føler meg sikker på at jeg kan håndtere uventede situasjoner på vegen.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Jeg har lavere ulykkesrisiko enn den gjennomsnittlige bilføreren.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Når jeg kjører bil vet jeg nøyaktig hvor jeg har bilen.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Når jeg kjører bil er det som om jeg har direkte kontakt med underlaget.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Når jeg oppdager en trang passasje et stykke frem på vegen vet jeg umiddelbart om det er plass nok til min bil.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Ved behov for rask bremsing vet jeg nøyaktig hvor jeg kommer til å stoppe med den farten jeg har.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Når jeg kjører bil kjennes det som om jeg blir ett med bilen.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Jeg blir ofte overrasket over hvor brått ting kan skje i trafikken.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Ved lukeparkering kan jeg parkere raskt og nøyaktig selv med minimal luke.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Ved rygging kan jeg rygge raskt og presist inn i en vanlig garasje.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Jeg har ingen problemer med å rygge bare ved å se i speilene.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Jeg oppfatter mulige farer tidligere enn hva andre trafikanter gjør.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Jeg er god til å kjøre med høy sikkerhet i trafikken.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Mine kjøreferdigheter er helt på topp.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Jeg får alltid med meg skiltingen der jeg kjører.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Dersom det kan gi bedre flyt i bytrafikken, hjelper jeg alltid fram møtende trafikanter som skal til venstre og må krysse mitt kjørefelt.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Jeg er en mester til å kjøre bil på glatt føre.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Jeg er svært god til å kjøre fort dersom det trengs.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Ved ufrivillig sladd vet jeg presist hvordan jeg må justere med rattet for å rette opp bilen.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Jeg er svært god til å forutse hva som kommer til å skje.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Jeg er svært god til å kjøre bil i mørket.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

	Helt riktig 1	Mest riktig 2	Både /og 3	Mest feil 4	Helt feil 5
24. Jeg er svært god til å komme effektivt fram i tett trafikk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Jeg gjør alltid riktige vurderinger av luker i tett trafikk.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Jeg har lett for å tro at luker i tett trafikk er kortere enn de egentlig er.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Jeg kjører slik at jeg alltid unngår å havne i farlige situasjoner.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Jeg er svært god til å holde minst tre sekunders avstand til forankjørende.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Jeg har svært rask reaksjonsevne.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
30. Ved kjøring i svinger hender det at jeg må gjøre raske småkorreksjoner med rattet.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Jeg vil helst unngå å foreta forbikjøringer.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

OPPFATNINGER OM TRAFIKK OG BILKJØRING

15. Hvor enig eller uenig er du i disse påstandene om trafikk og bilkjøring?

Ett kryss på hver linje.

	Svært enig 1	Enig 2	Både /og 3	Uenig 4	Svært uenig 5
1. Mange trafikkregler kan ikke overholdes hvis det skal være flyt i trafikken.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Det er fornuftig å kjøre litt for fort for å komme forbi lusekjørere.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Man bør overholde trafikkreglene uansett hvordan kjøreforholdene er.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Det er ikke rart at folk bryter fartsgrenser i Norge, så lave som de er.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Det er helt greit å kjøre på gult lys like før det skifter til rødt.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Det er ingen vits i å bli stående på rødt lys når det ikke er andre biler i nærheten.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Sjåførere som tar sjanser og bryter noen trafikkregler er ikke nødvendigvis mindre trafikksikre sjåførere enn de som kjører helt lovlig.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Det er greit å ta sjanser når det kun er deg selv som utsettes for risiko.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Trafikkregler er ofte for kompliserte til at de kan følges i praksis.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Hvis du er en dyktig sjåfør er det akseptabelt å kjøre litt fort.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Det er greit å kjøre i 100 km/t på en rett strekning når det ikke er noen andre i nærheten.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Det skulle vært strengere straffer for å bryte fartsgrensen.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Jeg sitter på med en uforsiktig sjåfør hvis det ikke er andre måter å komme seg hjem på.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Jeg sitter på med en som råkjører hvis andre gjør det.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Jeg risikerer ikke liv og helse ved å sitte på med en dårlig sjåfør.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Det er mitt ansvar å si ifra til venner når jeg synes de kjører uforsvarlig.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Jeg ville aldri kjørt etter å ha drukket alkohol.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Jeg ville aldri sitte på med en sjåfør jeg vet har drukket alkohol.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16. Vurder betydningen av følgende hovedområder for sikker bilkjøring og trafikksikkerhet.

Ett kryss på hver linje.

	Svært viktig 1	Viktig 2	Både /og 3	Uviktig 4	Svært uviktig 5
1. Teorikunnskaper fra føreropplæringen.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Høyt utviklede manøvreringsferdigheter (kontroll over kjøretøyet).....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Evne til å forutse hvordan en situasjon vil utvikle seg.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Muligheter til å velge andre transportmidler enn bil.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Egne og andres holdninger til trafikksikkerhet og ulykkesrisiko.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Synet på meningen med livet og personlige interesser.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

29. Hadde du førerkort for MC eller mopedførerbevis
før du tok førerkort for bil?

Ja..... ₁ Nei..... ₂

30. I hvilken måned og i hvilket år tok du førerkort for bil?
Januar = 1, februar = 2 osv. Oppgi årstall med 4 siffer.

Måned				År			

31. Hva slags tilgang har du til bil?

Bare ett kryss.

- Eier bil selv ₁
Disponerer annen bil som jeg kan bruke når jeg vil ₂
Husstanden disponerer bil som jeg kan låne av og til ... ₃
Kan av og til låne bil av venner/kjente ₄
Har vanligvis ikke tilgang til bil ₅

32. Hvor mange prikker har du fått i førerkortet?
NB: Hvis du ikke har fått prikker, skriver du 0 i feltet.

Jeg har fått prikker

33. Har du noen gang fått gebyr, bot, forenklet forelegg
eller fått førerkortet beslaglagt eller inndratt for
noen av disse trafikforseelsene?

- | | Ja
1 | Nei
2 |
|------------------------------------|--------------------------|--------------------------|
| 1. Forbikjøring | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Kjørt for fort | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. Feilparkering | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. Kjørt i påvirket tilstand | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Annet..... | <input type="checkbox"/> | <input type="checkbox"/> |

34. Hvordan vil du beskrive stedet der du bodde
da du lærte å kjøre bil?

Bare ett kryss.

- På landsbygda/ikke tettbygd strøk..... ₁
Tettsted (Under 10 000 innbyggere)..... ₂
Mindre by (Under 50 000 innbyggere)..... ₃
Større by (Over 50 000 innbyggere)..... ₄

35. I hvilken kommune har du hjemsteds-
adresse? *NB: Her tenker vi på kommunen
der du er registrert i folkeregisteret.*

- Oslo ₁ Trondheim..... ₃
Bergen..... ₂ Stavanger ₄
Annen kommune..... ₅

36. På hvilket forsøk besto du den
teoretiske førerprøven?

- Første forsøk ₁ Fjerde forsøk..... ₄
Andre forsøk..... ₂ Femte forsøk eller
Tredje forsøk ₃ senere)..... ₅

37. Hva slags teoriprøve hadde du
da du besto prøven?

- Vanlig skriftlig prøve ₁
Hadde muntlig prøve pga språket ₂
Hadde muntlig prøve av andre grunner..... ₃

38. På hvilket forsøk besto du den
praktiske førerprøven?

- Første forsøk ₁ Fjerde forsøk..... ₄
Andre forsøk..... ₂ Femte forsøk eller
Tredje forsøk ₃ senere..... ₅

Har du en kommentar til undersøkelsen, eller noen av temaene som tas opp,
kan du skrive i feltet på baksiden av dette arket

Din kommentar:

Legg skjemaet i svarkonvolutten og send det med en gang.

Takk for at du ville svare på spørsmålene!